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**U.S. Army
Environmental
Center**

**LANDFILL REMEDIATION
FEASIBILITY STUDY**

DEVENS, MASSACHUSETTS

VOLUME I OF II

TEXT, FIGURES AND TABLES

**CONTRACT DACA31-94-D-0061
TASK ORDER 0002**

**U.S. ARMY ENVIRONMENTAL CENTER
ABERDEEN PROVING GROUND,
MARYLAND**

JANUARY 1997

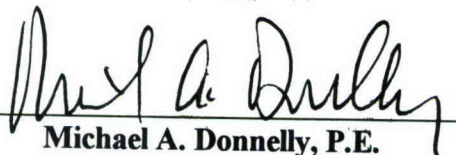
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**LANDFILL REMEDIATION
FEASIBILITY STUDY**

CONTRACT DACA31-94-D-0061
TASK ORDER 0002




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Prepared for:

U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland

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ABB Environmental Services, Inc.
Portland, Maine
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DEVENS, MA

EVALUATION CRITERIA	DEGREE OF ADHERENCE TO EVALUATION CRITERIA								
	ALTERNATIVE NO.								
	1	2	3	4	5	6	7	8	9
Overall protection of human health and the environment	Low	Medium	Medium	Medium	High	High	High	Medium	High
Compliance with ARARs	Low	Medium	Medium	Medium	Medium	High	High	Medium	High
Long-term effectiveness and permanence	Low	Medium	Medium	Medium	High	High	High	Medium	High
Reduction of toxicity, mobility, and volume through treatment	None	Low	Low	Low	Low	Low	Low	Low	Low
Effectiveness: Short-term	None	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Implementability	Low	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Cost	None	\$7.6M	\$9.5M	\$16.6M	\$19.6M	\$21.6M	\$12.5M	\$18.1M	\$20.2M

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20 9-1	Comparative Analysis of Alternatives
21	
22	

EXECUTIVE SUMMARY

ABB Environmental Services, Inc. (ABB-ES) prepared this Feasibility Study (FS) Report in accordance with the U.S. Army Environmental Center (USAEC) Contract DACA31-94-D-0061, Task Order No. 0002. The objective of this task order is to complete an engineering feasibility study that will enable preparation of a Record of Decision (ROD) for managing seven debris disposal areas at the Devens Reserve Forces Training Area (RFTA, formerly Fort Devens), Devens, Massachusetts.

The FS is being conducted in accordance with the U.S. Environmental Protection Agency (USEPA) Remedial Investigation/Feasibility Study Guidance Manual (USEPA, 1988), the USEPA guidance on conducting Remedial Investigation/Feasibility Studies for CERCLA Municipal Landfill Sites (USEPA, 1991a), the Federal Facility Agreement between the USEPA and the U.S. Department of the Army, also referred to as the Interagency Agreement (IAG) (USEPA, 1991b), and the National Contingency Plan (NCP) (USEPA, 1990a).

During the collection of information for the MEP and subsequent studies, the Army identified seven debris disposal areas throughout Fort Devens. These disposal areas are in addition to the Shepley's Hill Landfill, which has served as the primary solid waste disposal location at the installation. This 80-acre facility (Area of Contamination [AOC] 05) has closed under a state-approved Resource Conservation and Recovery Act (RCRA) Subtitle D Closure Plan and is being remediated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The seven debris disposal areas have been the subject of previous investigations under CERCLA, and have been found to pose varying risks to public health and the environment. The Army has determined from discussions with federal and state regulatory agencies that the disposal areas must be managed, with consideration given to the Massachusetts solid waste management regulations.

EXECUTIVE SUMMARY

1 The Army has decided to address the disposal areas under the CERCLA Feasibility Study
2 process due to the benefits of: (1) a consistent administrative approach for all sites;
3 (2) similarity of waste material; and (3) the administrative difficulty in mixing CERCLA
4 and non-CERCLA waste.

5
6 Management of the debris disposal areas is being further influenced by property reuse
7 considerations. The Massachusetts Government Land Bank (MGLB) and its consultants
8 have indicated that water supply and wastewater resources will be affected by the
9 management options chosen for the disposal areas.

10
11 Three previous documents contained evaluations of options for managing the seven debris
12 areas. These are the Plan of Action (see Appendix A), the Draft Landfill Consolidation
13 Feasibility Study Report (ABB-ES, 1995), and the Debris Disposal Area Technical
14 Memorandum (ABB-ES, 1996). Pertinent information developed in the documents are
15 contained in this report.

16
17 **Plan of Action.** The Plan of Action constituted an agreement to proceed with plans for
18 consolidating debris from the seven disposal areas into a single disposal site. The Plan was
19 endorsed by the Fort Devens BRAC Environmental Coordinator, USEPA Region I,
20 Massachusetts Department of Environmental Protection (MADEP), and the MGLB. The
21 Plan of Action considered six debris management options. Each option was comprised of
22 one or more of the following actions: (1) debris consolidation to a single on-site disposal
23 area, (2) capping of debris disposal areas in-place, and (3) debris disposal at an offsite
24 commercial facility. Of these, Plan of Action proponents favored excavating debris from
25 all seven areas, and consolidating the debris at a vacant parcel of land east of Shepley's
26 Hill Landfill.

27
28 **Landfill Consolidation Feasibility Study Report.** The consolidation FS report
29 evaluated in detail the excavation/consolidation option endorsed in the Plan of Action. Its
30 purpose was to enable preparation of a ROD for consolidating debris from the seven
31 disposal areas into a single waste disposal site. However, review comments on the FS
32 report from the U.S. Army Forces Command (FORSCOM) caused Plan of Action

EXECUTIVE SUMMARY

1 proponents to reconsider the evaluation process from which landfill consolidation was
2 selected. FORSCOM requested evaluation of non-consolidation options such as capping
3 disposal areas in-place or no further action.

4
5 **Debris Disposal Area Technical Memorandum.** The technical memorandum evaluated
6 a containment (i.e., capping) alternative, and a consolidation alternative for each of the
7 seven landfills. The memorandum was prepared in response to FORSCOM comments on
8 the consolidation FS report.

9
10 To further respond to FORSCOM's concerns, Plan of Action proponents chose to prepare
11 this FS report. In addition to the consolidation-only option, this report evaluates debris
12 management options containing non-consolidation actions, including those originally
13 developed in the Plan of Action.

14 The purpose of this FS Report is to:

- 15
16 • establish response objectives describing the environmental and
17 administrative benefits of debris management;
- 18
19 • identify the types of response actions necessary to achieve response
20 objectives;
- 21
22 • identify and screen specific remedial technologies that may be capable of
23 attaining response objectives;
- 24
25 • develop and evaluate a range of remedial alternatives based on those
26 technologies; and
- 27
28 • compare the alternatives in accordance with criteria recommended by
29 USEPA.

30
31 This FS Report is based on information and data presented in the various Site Investigation
32 (SI) and Remedial Investigation (RI) reports prepared for the seven debris disposal areas. The
33 debris disposal areas are: Study Areas (SAs) 6, 12, and 13, and Areas of Contamination
34 (AOCs) 9, 11, 40, and 41.

ABB Environmental Services, Inc.

EXECUTIVE SUMMARY

1 Site Investigations (SIs) were conducted at Study Areas (SAs) 12 and 13 and AOCs 9, 40, and
2 41 to verify the presence or absence of environmental contamination and to determine whether
3 further investigation or remediation was warranted. Supplemental SI activities were also
4 conducted at SAs 12 and 13 and AOC 41 to address data gaps identified in the SI reports. RIs
5 were completed at AOCs 11, 40, and 41 to further assess the distribution of contaminants; the
6 RIs included human health and ecological risk assessments for the three sites.
7

8
9 In addition to the SI and Supplemental SI activities, predesign investigations were conducted at
10 SAs 6, 12, and 13 AOCs 9, and 40 to define the depth, areal extent, composition of waste, and
11 site conditions in order to identify appropriate remedial alternatives.
12

13 Development of alternatives to meet landfill management goals begins with the identification
14 and screening of potentially applicable remedial technologies. The number of identified
15 technologies was reduced during screening in which the advantages and disadvantages of the
16 effectiveness and implementability of each technology were evaluated. Technologies retained
17 have the potential for effectively achieving response objectives, either alone or in combination
18 with other technologies. The process used for technology screening is consistent with USEPA
19 RI/FS guidance.
20

21 Remedial technologies retained after screening for each site were assembled into remedial
22 alternatives. The remedial alternatives were then screened upon consideration of effectiveness,
23 implementability, and cost. A summary of alternatives considered for detailed evaluation is
24 presented in Table ES-1.
25

26 The alternatives retained after screening (i.e., Alternative Nos. 1 through 9 in Table ES-1) were
27 evaluated in detail using criteria suggested in the RI/FS guidance. The alternatives evaluated
28 include consolidating debris at a proposed site near Shepley's Hill Landfill, and capping the
29 landfills in place. A summary of the detailed evaluation of the retained alternatives is presented
30 in Table ES-2.

1.0 INTRODUCTION

ABB Environmental Services, Inc. (ABB-ES) prepared this Feasibility Study (FS) Report in accordance with the U.S. Army Environmental Center (USAEC) Contract DACA31-94-D-0061, Task Order No. 0002. The objective of this task order is to complete an engineering FS that will enable preparation of a Record of Decision (ROD) for managing seven debris disposal areas at the Devens Reserve Forces Training Area (RFTA, formerly Fort Devens), Devens, Massachusetts. These disposal areas are:

- Study Area (SA) 6
- Area of Contamination (AOC) 9
- AOC 11
- SA 12
- SA 13
- AOC 40
- AOC 41

The FS is being conducted in accordance with the U.S. Environmental Protection Agency (USEPA) Remedial Investigation (RI)/FS guidance manual (USEPA, 1988), the USEPA guidance on Conducting Remedial Investigation/Feasibility Studies for CERCLA Municipal Landfill Sites (USEPA, 1991a), the Federal Facility Agreement between the USEPA and the U.S. Department of the Army, also referred to as the Interagency Agreement (IAG) (USEPA, 1991b), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (USEPA, 1990a).

Fort Devens was identified for cessation of operations and closure under Public Law 101-510, the Defense Base Closure and Realignment (BRAC) Act of 1990, and officially closed in September 1996. Portions of the property formerly occupied by Fort Devens were retained by the Army for reserve forces training and renamed the Devens Reserve Forces Training Area. Areas not retained as part of the Devens RFTA were, or are in the process of being, transferred to new owners for reuse and redevelopment. Fort Devens was placed on the National Priority List (NPL) on December 21, 1989, under the

ABB Environmental Services, Inc.

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1 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as
2 amended by the Superfund Amendments and Reauthorization Act (SARA).
3
4

5 **1.1 DEVENS RESERVE FORCES TRAINING AREA BACKGROUND**

6

7 The Devens RFTA is located within the towns of Ayer and Shirley (Middlesex County)
8 and Harvard and Lancaster (Worcester County), approximately 35 miles northwest of
9 Boston, Massachusetts. It was established in 1996, coincident with the closure of Fort
10 Devens, to provide facilities for the training of reserve forces in central New England.
11 The Devens RFTA includes portions of the former North Post and Main Post, and the
12 entire South Post, and lies within the Ayer, Shirley, and Clinton map quadrangles
13 (7½-minute series).
14

15 Fort Devens was established in 1917 as Camp Devens, a temporary training camp for
16 soldiers from the New England area. In 1931, the camp became a permanent installation
17 and was redesignated as Fort Devens. Throughout its history, Fort Devens served as a
18 training and induction center for military personnel and a unit mobilization and
19 demobilization site. All or portions of this function occurred during World Wars I and II,
20 the Korean and Vietnam conflicts, and operations Desert Shield and Desert Storm.
21

22 Over 3,000 acres at Fort Devens were developed for housing, buildings, and other
23 facilities and the installation was reported as the largest undeveloped land holding under a
24 single owner in north-central Massachusetts (U.S. Fish and Wildlife Service [USFWS],
25 1992). The North Post consisted primarily of the Moore Army Airfield and the site of the
26 installation's wastewater treatment facility. The Main Post was the site of numerous
27 buildings, including vehicle maintenance facilities, training and administrative buildings,
28 barracks and other military housing, and recreational facilities. The South Post, largely
29 undeveloped, is located south of Massachusetts Route 2 and was used for field training
30 exercises.
31
32

1.2 STATUS OF LANDFILLS AT FORT DEVENS

In conjunction with the U.S. Army Installation Restoration Program, the USAEC developed a Master Environmental Plan (MEP) for Fort Devens in 1992. The MEP included assessments of the environmental status of study areas (SAs), specified necessary investigations, and provided recommendations for response actions with the objective of identifying priorities for environmental restoration at Fort Devens. Areas Requiring Environmental Evaluation (AREEs) and SAs were identified and investigations initiated to determine where removal actions were necessary.

During the collection of information for the MEP and subsequent studies, the Army identified seven debris disposal areas throughout Fort Devens (Figure 1-1). These disposal areas were in addition to the Shepley's Hill Landfill, which served as the primary solid waste disposal location at the installation. This 80-acre facility (Area of Contamination [AOC] 05) was closed under a state-approved Resource Conservation and Recovery Act (RCRA) Subtitle D Closure Plan, and is being remediated under CERCLA. The ROD for the Shepley's Hill Landfill Operable Unit (ABB-ES, 1995b) describes the selected remedy for the site (i.e., landfill closure with a low-permeability cap and associated actions).

Included within AOC 05 are the smaller AOC 04 and AOC 18. AOC 04, the sanitary landfill incinerator, was located in former Building 38 near the end of Cook Street within the area included in Phase I of the sanitary landfill closure. The incinerator was constructed in 1941, and burned household refuse until the late 1940s. Ash from the incinerator was buried in the landfill. The incinerator was demolished and buried in the landfill in September 1967. The building foundation was removed and buried on-site in 1976.

AOC 18, the asbestos cell, is located in the section of the landfill that was closed during Phase IV. An estimated 6.6 tons of asbestos construction debris were placed in the section closed during Phase IV-A, between March 1982 and November 1985. A new asbestos cell was opened in 1990 in the section closed during Phase IV-B, and used for disposal of small volumes of asbestos-containing material until July 1992.

SECTION 1

1 The seven debris disposal areas have been the subject of previous investigations under
2 CERCLA, and have been found to pose varying risks to human health and the
3 environment. The Army has determined from discussions with federal and state regulatory
4 agencies that the disposal areas must be managed, with consideration given to the
5 Massachusetts solid waste management regulations.

6
7 The Army has decided to address the disposal areas under the CERCLA Feasibility Study
8 process due to the benefits of: (1) a consistent administrative approach for all sites;
9 (2) similarity of waste material; and (3) the administrative difficulty in mixing CERCLA
10 and non-CERCLA waste.

11
12 Management of the debris disposal areas is being further influenced by property reuse
13 considerations. The Massachusetts Government Land Bank (MGLB) and its consultants
14 have indicated that water supply and wastewater resources will be affected by the
15 management options chosen for the disposal areas.

16 17 18 **1.3 PREVIOUS DOCUMENTS ADDRESSING DEBRIS AREA MANAGEMENT**

19
20 Three previous documents evaluated options for managing the seven debris areas: the
21 BRAC Cleanup Team (BCT) Plan of Action (Appendix A), the Draft Landfill
22 Consolidation Feasibility Study Report (ABB-ES, 1995), and the Debris Disposal Area
23 Technical Memorandum (ABB-ES, 1996a). Pertinent information developed in the latter
24 documents is contained in this report.

25
26 **Plan of Action.** The Plan of Action constituted an agreement to proceed with plans for
27 consolidating debris from the seven disposal areas into a single disposal site. The Plan
28 was endorsed by the Fort Devens BRAC Environmental Coordinator, USEPA Region I,
29 Massachusetts Department of Environmental Protection (MADEP), and the MGLB. The
30 Plan of Action considered six debris management options, each comprised of one or more
31 of the following actions: (1) debris consolidation to a single on-site disposal area, (2)
32 capping of debris disposal areas in-place, and (3) debris disposal at an offsite commercial
33 facility. Of these, Plan of Action proponents favored excavating debris from all seven
34 areas and consolidating the debris at a vacant parcel of land east of Shepley's Hill Landfill.

1
2 **Landfill Consolidation Feasibility Study Report.** The consolidation FS report
3 (ABB-ES, 1995c) evaluated in detail the excavation/consolidation option endorsed in the
4 Plan of Action. Its purpose was to enable preparation of a ROD for consolidating debris
5 from the seven disposal areas into a single waste disposal site. However, review comments
6 on the FS report from the U.S Army Forces Command (FORSCOM) caused the Plan of
7 Action proponents to reconsider the evaluation process from which landfill consolidation
8 was selected. FORSCOM requested evaluation of non-consolidation options such as
9 capping disposal areas in-place or no further action.

10
11 **Debris Disposal Area Technical Memorandum.** The technical memorandum evaluated
12 a containment (i.e., capping) alternative and a consolidation alternative for each of the
13 seven landfills. The memorandum was prepared in response to FORSCOM comments on
14 the consolidation FS report.

15
16 To further respond to FORSCOM's concerns, Plan of Action proponents chose to prepare
17 this FS report. In addition to the consolidation-only option, this report evaluates debris
18 management options containing non-consolidation actions, including those originally
19 developed in the Plan of Action.

20 21 22 **1.4 PURPOSE AND ORGANIZATION OF REPORT**

23
24 The purpose of this FS Report is to:

- 25
26 • establish response objectives describing the environmental and administrative
27 benefits of debris management;
- 28
29 • identify the types of response actions necessary to achieve response objectives;
- 30
31 • identify and screen specific remedial technologies that may be capable of
32 attaining response objectives;
- 33

SECTION 1

- develop and evaluate a range of remedial alternatives based on those technologies; and
- compare the alternatives in accordance with criteria recommended by USEPA.

This report is based on information and data presented in the various Site Investigation (SI) and RI reports prepared for the seven debris disposal areas. These reports are referenced in the debris disposal site descriptions presented in this section.

This report consists of nine sections. Section 2 provides descriptions of the seven debris disposal sites, including the nature and extent of contamination. Section 3 summarizes results of the baseline risk assessment and preliminary risk evaluation (PRE) discussions presented in the SI and RI reports.

Section 4 discusses chemical-specific, location-specific, and action-specific Applicable or Relevant and Appropriate Requirements (ARARs) and their role in site remediation.

Section 5 identifies remedial action objectives. Section 6 identifies and screens potential remedial technologies.

Section 7 develops and screens potential remedial alternatives. Section 8 contains the detailed analysis of alternatives, and Section 9 contains the comparative analysis of alternatives.

2.0 CHARACTERIZATION OF WASTE DISPOSAL SITES

The Enhanced Preliminary Assessment (Weston, 1992) identified and characterized areas requiring environmental evaluation (AREESs) associated with historical and current uses of the Devens property.

The Enhanced PA recommended that site reconnaissance and a geophysical survey be conducted at each of the seven landfills to determine their exact location and areal extent. A field investigation comprised of surface water, sediment, soil, and/or groundwater sampling would follow. The Enhanced PA further proposed that if necessary, remedial action would be taken at SA 12, SA 13, and AOC 41. For AOC 41, the report recommended that a Remedial Investigation/Feasibility Study (RI/FS) be undertaken. The RI/FS would include soil, groundwater, surface water and sediment sampling as well as quarterly water level measurement.

SIs were conducted at SAs 12 and 13, and AOCs 9, 40, and 41 to verify the presence or absence of environmental contamination and to determine whether further investigation or remediation was warranted. In addition, supplemental SI activities were conducted at SAs 12 and 13, and AOC 41 to address data gaps identified in the SI reports. RIs were completed at AOCs 11, 40, and 41 to further assess contaminant distribution; the RIs included baseline human health and ecological risk assessments for the three sites. Risk assessment results are summarized in Section 3.

In addition to the SI and Supplemental SI activities, predesign investigations were conducted at SAs 6, 12, and 13, and AOCs 9 and 40 to define depth, areal extent, type of waste, composition of waste, and site conditions to help identify appropriate remedial alternatives.

The following subsections describe the history of waste disposal and associated nature and extent of contamination at the seven landfills. Previous documentation of the disposal areas can be found in the Administrative Record according to study group. The study group number pertinent to each area is designated in parentheses in the subsection titles.

SECTION 2

2.1 STUDY AREA 6 (GROUP 10)

The South Post Household Debris Landfill (Landfill No. 2), also referred to as SA 6, was used between 1850 and 1920 for disposal of household waste (Biang et al., 1992). It is located on the South Post, within Tactical Training Area 6A. A variety of household wastes were deposited in a low area, less than 0.25 acres in size, south of the access road. SA 6 is moderately forested with hardwood trees (e.g., red maple, ash, yellow birch, and hickory), with trunk diameters up to 12 inches. An abandoned cellar hole is located across the road. The disposal area has not been covered, and trash is visible on the ground surface. Figure 2-1 is a plan of the site showing the extent of debris as interpreted from test trenches. Scattered surficial debris may extend beyond the limits shown. Cross sections depicting subsurface information learned from test trenching are shown in Figures 2-2 and 2-3.

Nature and Extent of Contamination. Predesign activities at this site included excavation of six test trenches to define the extent and depth of landfilled material and to determine the composition of the waste. The trenches contained concentrated household debris, primarily metal and glass. Military-type waste was not observed. Waste appeared to be deposited on a layer of cobbles, presumably a natural formation. The water table, encountered at a depth of approximately 5 feet below ground surface (bgs) at the lowest area of the landfill, was observed to be below the bottom of waste at that location. The maximum depth of waste was observed to be approximately 5 feet. The volume of waste in the landfill, calculated based on observed depth and lateral extent, was approximately 500 cubic yards (cy). Waste volume calculations for SA 6 and the other six Devens landfills can be found in Appendix B. Actual waste volumes may vary from those derived in the calculations. The volumes are believed to be within the bounds of accuracy acceptable for this preliminary engineering study.

Due to the apparent age of waste at the site, archaeologists were present during trench excavation to characterize and date the waste and to assess the cultural value of the site. Personnel from The Public Archaeology Laboratory, Inc. of Pawtucket, Rhode Island observed the excavations at SA 6 (Public Archaeology Laboratory, Inc., 1994). The archaeologists noted cultural materials at the site manufactured in the late 1700s to early

1 1900s, with the majority of the material dating from the late 1800s to 1900. Waste was
2 identified as primarily household debris, potentially originating from more than one
3 household proximal to the site prior to the property's incorporation into Fort Devens. The
4 site was determined to be potentially valuable in researching the socioeconomic status and
5 refuse disposal behavior of 19th Century northern Lancaster residents. Additional studies
6 of the site prior to remedial or removal actions were recommended by the archaeologists.
7 Soil sampling was not conducted at SA 6 due to the age and type of waste observed, and
8 the lack of evidence of contamination.

9
10 ABB-ES personnel also characterized the site to determine whether the site would be
11 considered a wetland under state or federal jurisdiction. Vegetation, hydrology, and soil
12 type were examined within the basin-like depression in the western portion of SA 6. This
13 basin represents the lowest point of elevation at SA 6. While it is possible that during the
14 spring and early summer this basin may hold water, no federal or state jurisdictional
15 wetlands were identified at SA 6.

16 17 18 **2.2 AREA OF CONTAMINATION 9 (GROUP 5)**

19
20 AOC 9, the North Post Landfill, is located on the North Post, west of the Fort Devens
21 wastewater treatment plant. It is known informally as the old "stump dump" or "wood
22 dump", or Landfill No. 5. The landfill is part of a larger area that is controlled by Fort
23 Devens Range Control and occasionally used for tactical training exercises.

24
25 The landfill was operated from the late 1950s until 1978, when access was uncontrolled.
26 It was used by the Army, National Guard, contractors, and off-post personnel (McMaster
27 et al., 1982; Biang et al., 1992). Materials reportedly disposed of at this location include
28 tree stumps, limbs, and the debris from about 100 demolished buildings. Automobiles,
29 automobile parts, and other debris (including asphalt, bedsprings, and 5-gallon cans) were
30 observed in a location above and adjacent to the north side of the landfill, on the lower
31 slope from the wastewater infiltration beds.

32
33 The landfill occupies a low area that originally contained a small pond (Jahns, 1953), and
34 the bluffs to the west have been used for gravel quarrying. The disposal of solid waste

SECTION 2

1 and placement of cover gravel have filled the depressions and raised the land surface
2 approximately 35 to 40 feet (ft) (McMaster et al., 1982). Because of the extent and
3 effectiveness of the partially vegetated cover, the area is generally not recognizable as a
4 former landfill. Soils are typical of kame, kame-plain, and ice-contact deposits consisting
5 of sand and pebble-to-cobble gravel. These soils are also visible in the bluff to the west of
6 the landfill. Immediately south of the landfill are post-glacial swamp and floodplain
7 deposits consisting of sand with variable gravel and silt content.

8
9 An SI was conducted by ABB-ES under contract with the USAEC (ABB-ES, 1996b).
10 The purpose of the SI was to verify the presence or absence of environmental
11 contamination and to determine whether further investigation or remediation was
12 warranted.

13
14 A geophysical survey was conducted at the landfill to supplement information derived
15 from evaluation of aerial photographs and delineate the actual limits of the landfill. The
16 results of the survey assisted in the placement of test pits and groundwater monitoring
17 wells, and provided insight into the distribution of landfilled materials. Results of the
18 geophysical survey indicated that the landfill consists of five areas: a larger northern pod
19 containing the majority of landfilled materials, and four smaller southern pod adjacent to
20 the wetlands containing mostly near-surface debris (Figure 2-4). Cross sections depicting
21 subsurface information from test trenching are shown in Figures 2-5 and 2-6.

22
23 Nature and Extent of Contamination. Surface water and sediment samples were collected
24 from the Nashua River and the swampy area south of the landfill. Results indicated that
25 coliform bacteria counts and concentrations of inorganics were elevated in surface water
26 samples. Polynuclear aromatic hydrocarbons (PAHs) were detected in sediment samples
27 from the Nashua River and the pond nearby. Concentrations of these analytes were
28 generally low, and no consistent distribution along the river was apparent. Total
29 petroleum hydrocarbon compounds (TPHC) were detected in sediment samples in a
30 similar sporadic distribution, but no significant correlation between PAHs and TPHC was
31 evident. TPHC and inorganics were elevated in sediment in the swampy area.

32
33 Soil borings for monitoring wells G5M-92-01X through G5M-92-03X were drilled just
34 outside the limits of the North Post Landfill (to avoid penetrating landfill materials), to

1 approximately 10 ft below the water table. Two rounds of groundwater samples and
2 water table measurements, collected three months apart, were collected from the three
3 new monitoring wells and 16 existing monitoring wells. The 16 existing monitoring wells
4 were installed to evaluate the effectiveness of the wastewater treatment plant (SA 19).
5 Due to cross-contamination likely resulting from the pump used to purge the wells during
6 the second sampling round, a third round of groundwater samples was collected for
7 volatile organic compounds (VOCs) only. To evaluate the potential impact to
8 groundwater due to releases from the landfill, analytes detected in five selected wells
9 located radially around the landfill (WWTMW-07, WWTMW-08, G5M-92-01X,
10 G5M-92-02X, and G5M-92-03B) were compared to the other 14 wells. The absence of
11 organic compounds in groundwater adjacent to and downgradient from the mapped
12 landfill suggests that the organic compounds detected in soil have not impacted
13 groundwater quality. Low counts of coliform bacteria were measured in landfill wells
14 G5M-92-01X and G5M-92-02X in Round 1 and WWTMW-08 in Round 2. In the five
15 selected landfill wells, concentrations of several inorganic analytes were elevated in up-,
16 down-, and cross-gradient wells. Elevated concentrations of these analytes correlated well
17 with elevated total suspended solids (TSS) concentrations. Filtered samples collected
18 during Round 2 exhibited significant reductions in the concentrations of inorganic analytes
19 such as arsenic, chromium, iron, lead, vanadium, and zinc. Other more soluble inorganic
20 analytes also showed concentration reductions, but not to the same magnitude.

21
22 To further characterize the nature of soils and landfilled materials, four test pits
23 (09E-92-01X through 09E-92-04X) were excavated in 1992 in areas where landfilled
24 material was identified during geophysical surveys. A cross section depicting subsurface
25 information from test pitting is shown in Figure 2-5. Test pitting within the suspected
26 landfill limits showed the landfilled contents consist of mixed refuse, including piping,
27 brick, charred wood, roof slate, bottles, carpet, and plastic, and silt and sand. Soil samples
28 were collected from apparent zones of contamination in each of the four test pits. In most
29 cases, the samples were collected from darkened or stained soil, presumably from burned
30 materials. A total of eight soil samples was collected. Significant semivolatile organic
31 compound (SVOC) concentrations (mostly PAHs) were detected in soil samples from test
32 pits 09E-92-01X and 09E-92-02X. SVOCs were, however, absent in soil collected from
33 test pits 09E-92-03X and 09E-92-04X. TPHC levels were detected in all test pits except
34 09E-92-04X, located just outside the southern limit of geophysical mapped landfill

SECTION 2

1 materials. The test pit log for 09E-92-04X indicated that the soil was relatively free of
2 landfill debris, suggesting that this pit is on the fringe of the landfill. Organic compounds
3 detected in soil samples collected from the landfill test pits are likely derived from the ash
4 and charred wood observed during sampling; absence of volatile petroleum compounds in
5 soil supports this contention. Absence of organic compounds in groundwater adjacent to
6 and downgradient from the landfill suggest that organic compounds detected in soil have
7 not impacted groundwater quality. Several inorganic analytes, including barium and zinc,
8 were detected in test pit soils above the calculated background concentrations for Fort
9 Devens soils.

10
11 Predesign activities at AOC 9 included excavation of four test trenches in 1994. Because
12 three test pits were excavated in the main portion of the landfill in 1992, this predesign
13 activity focused on verifying the extent of debris identified by a previous geophysical
14 survey and determining the composition of waste in the southernmost part of the landfill.
15 A cross section depicting subsurface information from test trenching is shown in
16 Figure 2-6.

17
18 Test trench 09E-94-05X was excavated across the gravel access road on the south end of
19 the landfill. A layer (1 to 4 ft in depth) of clean fill was exposed above a layer of
20 concentrated lumber, concrete, sheet metal, structural steel, pipes, asphalt pavement, and
21 insulation. The layer was observed to have been burned. The test trenches were
22 excavated no deeper than the water table, which was encountered approximately 6 ft bgs
23 in 09E-94-05X. The bottom of the debris layer is below the water table.

24
25 Test trench 09E-94-06X was excavated in the southernmost portion of the landfill. Sheet
26 metal, pipe, steel cable, bricks, a section of a brick chimney, and a 4 ft x 4 ft x 2 ft block of
27 formed concrete were primarily located in the top 1 foot of soil. This layer consists of
28 organic-rich sand and roots of alder, poplar, and birch trees. Natural soil, (gravelly sand
29 to silty fine sand) was observed below 1 foot. The water table is approximately 5 ft bgs at
30 this location. Material in test trench 09E-94-07X is similar to that observed in
31 09E-94-06X, but the fill layer is approximately 2.5-ft thick. The water table was
32 encountered at approximately 6 ft bgs at this location.
33

1 Test trench 09E-94-08X intercepted a gravelly sand fill berm along the roadside. Beneath
2 and east of the berm, debris similar to that described in the other trenches was
3 encountered in a layer 2.5- to 5-ft thick. The water table was approximately 7 ft bgs at
4 this location.

5
6 SEA Consultants (SEA), under contract with MGLB, excavated 22 test pits at AOC 9 in
7 1996 (SEA, 1996). Waste depths observed in those explorations augmented information
8 from the 1992 and 1994 test excavations. The type of waste observed by SEA was
9 generally demolition debris (i.e., wood, concrete, asphalt, metal, brick, plastic, glass, and
10 stumps). The combined information was used to calculate debris volume at AOC 9, by
11 multiplying the waste areas (from the geophysical survey) by the average depth of waste
12 (as interpreted from test trenches. The volume of waste is estimated at 112,000 cy (see
13 Appendix B).

14
15 A vegetated wetland area lies to the south of AOC 9. Although much of this wetland is
16 subject to both state and federal jurisdiction, a small region of wetlands in the eastern
17 portion of the site contains wetlands that are subject to state, but not federal, jurisdiction.

18 19 20 **2.3 AREA OF CONTAMINATION 11 (GROUP 9)**

21
22 The Lovell Road Debris Disposal Area (Landfill No. 7), also referred to as AOC 11, was
23 identified as a 2-acre landfill that received wood-frame hospital demolition debris from
24 1975 to 1980. The landfill is within a wetlands complex that runs along the western side
25 of the Nashua River. East of the landfill, a 40-ft-wide soil berm separates the landfill from
26 the Nashua River. Refuse, including large pieces of metal, wood, bricks, and other
27 construction debris is exposed at the ground surface throughout the site, except where an
28 access road has been constructed over the fill. The landfill area is vegetated and is
29 bordered on the north and south by wetlands. Site features are shown on Figure 2-7.
30 Cross sections depicting subsurface information from test trenches are shown in
31 Figures 2-8 and 2-9.

32
33 Nature and Extent of Contamination. Initial SI activities at AOC 11 were conducted in
34 1993 as part of the Main Post SI (Arthur D. Little, 1994). The SI consisted of geophysics

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1 to determine the extent of waste, sampling and analysis of soil in test pits excavated in the
2 landfill area, and sampling and analysis of surface water and sediment samples from the
3 Nashua River and wetlands areas adjacent to the landfill. Metal, wood, and plastic debris
4 was observed in the test pits. Test pit soils contained acrylonitrile, PAH compounds,
5 pesticides, and several inorganic analytes. Metals, SVOCs, pesticides, and TPHC were
6 detected in surface water and sediments in the wetlands. Contaminant concentrations in
7 wetland sediments were not significantly higher than concentrations in the Nashua River.
8 Most contaminant concentrations, with the exception of iron, in the river near AOC 11
9 were not significantly elevated in comparison with other sample locations upstream and
10 downstream of AOC 11.

11
12 Because contaminants were detected in soils, surface water, and sediment during the SI,
13 further investigation was recommended and an RI was conducted at AOC 11 from
14 September to December 1994 (Arthur D. Little, 1995). The RI field work included
15 excavation of additional test pits and sampling of subsurface soil, surface soil sampling,
16 ambient air sampling, surface water and sediment sampling, monitoring well installation,
17 and groundwater sampling. Piezometers and surface water gauges were also installed to
18 evaluate the hydraulic connection between wetlands, groundwater, and the Nashua River.

19
20 Test pits excavated during the RI indicated that debris was present over a 2.1-acre area, to
21 depths ranging from 2 to 13.5 ft. In test pits where the water table was encountered,
22 refuse extended an average of 2 ft below the water table (see Figures 2-8 and 2-9). The
23 volume of waste was estimated to be approximately 35,000 cy (see Appendix B). Refuse
24 observed in the test pits included wood, concrete, metal pipes, scrap metal, wire, tile, and
25 glass, intermixed with sand.

26
27 The RI analytical results indicated that surface and subsurface soils within the landfill area
28 contain pesticides, metals including cadmium, copper, and mercury, and PAHs. The
29 wetlands adjacent to AOC 11 contain pesticides, metals, PAHs, and polychlorinated
30 biphenyls (PCBs), where concentrations are similar to or lower than concentrations of
31 these contaminants in the reference wetland upstream of AOC 11. Surface water data did
32 not indicate that contaminants are migrating beyond the wetlands. Groundwater sample
33 results indicated that low levels of some metals are being transported from the landfill to
34 the Nashua River via groundwater flow.

2.4 STUDY AREA 12 (GROUP 7)

The Range Control Landfill (Landfill No. 8), also referred to as SA 12, was used by the Army beginning in 1960, was still in use in 1982, and appeared in 1988 to have been inactive for several years (McMaster et al., 1982; Biang et al., 1992). The debris came from construction and range operations. The landfill is about 0.5 acre in size, located on a steep, wooded slope adjacent to the Nashua River floodplain and partially encroaching on associated wetlands on the South Post of Fort Devens. The landfill is located across Dixie Road from B and P Ranges.

The top of the slope is covered with dense brush. The north and south sides of the landfill are bounded (and defined) by dense growth of large (60-ft high, 20-inch diameter) oak trees. A wetland is located at the base of the slope on the east side. Site features are shown on Figure 2-10. A representative cross section based on test trench data is shown on Figure 2-11.

Nature and Extent of Contamination. Initial SI activities at SA 12 were conducted in August 1992 as part of the Group 7 field activities (ABB-ES, 1995d). The SI consisted of sampling and analysis of groundwater from a monitoring well installed upgradient of the landfill, sampling and analysis of four surface soil samples from the landfill cover material, sampling and analysis of four groundwater and sediment sample pairs from shallow sumps dug in the floodplain near the base of the landfill, and sampling and analysis of four surface water and sediment sample pairs (two from the backwater lagoon and two from the Nashua River). Samples collected from the cover soil contained low concentrations of pesticide and PCB compounds, and several inorganic analytes were detected above Fort Devens background values. Pesticides, PCBs, PAHs, TPHC, and several inorganics were detected in sediments in the backwater area at the base of the slope.

Potential human health and ecological risks were identified during the SI based on the concentrations of organic and inorganic analytes in surface water and sediment at SA 12 (ABB-ES, 1994a). In order to better identify the sources and the fate and transport mechanisms for site contaminants, Supplemental SI field activities were implemented. The

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1 Supplemental SI focused on sampling surface water and sediment in the backwater area
2 adjacent to SA 12 to further define contaminant distribution and to provide a partial basis
3 for distinguishing SA-derived contamination from Nashua River-derived contamination,
4 particularly in the SA 12 backwater. Reference backwater sampling locations were also
5 selected at upriver and downriver locations to determine if similar contaminant profiles
6 exist in the surface water and sediment of comparable floodplain environments remote
7 from SA 12 (i.e., to identify the contribution of Nashua River contamination in the SA 12
8 backwater). Results of this investigation concluded that similar contaminants were present
9 in the backwater areas upstream and downstream of SA 12, and a comparison of arsenic,
10 copper, and lead concentrations in sediment in the area immediately downgradient of the
11 landfill suggested that contamination in the backwater may have resulted from seasonal
12 flooding of the Nashua River rather than from the landfill.

13
14 Predesign activities at SA 12 included excavation of five test trenches to define the
15 western extent and depth of landfilled material and to determine the composition of the
16 waste. A representative cross section based on test trench data is shown in Figure 2-11.
17 Gravelly sand with debris such as lumber, sheet metal, concrete, and other construction
18 materials, was encountered in the top layer of each test trench. A 6- to 12-inch layer of
19 leaves, wood, and wood ash mixed with soil was observed beneath the top layer in test
20 trenches 12E-94-02X through 12E-94-04X. Beneath this layer, dense, silty sand was
21 observed. While some debris was observed in the silty sand layer in trench 12E-94-03X,
22 this layer is not believed to contain significant landfilled material. Samples were not
23 collected for chemical analysis. The volume of waste was estimated to be approximately
24 8,700 cy, based on the area and estimated average depth of 12 ft (see Appendix B).

25
26 Due to the past use of the site as the Range Control Landfill, unexploded ordnance (UXO)
27 clearance specialists were subcontracted to excavate and monitor the trenches. No live
28 ordnance or explosive materials were encountered. ABB-ES personnel also characterized
29 the site to determine the wetland limits under state or federal jurisdiction.

30
31 The topography at SA 12 is distinct and the wetland boundary abrupt. The borders of the
32 wetlands under federal and state regulations are not differentiated; therefore, a joint
33 state/federal wetland boundary line is delineated at this study area.
34

2.5 STUDY AREA 13 (GROUP 2)

The Lake George Street Landfill (Landfill No. 9), also referred to as SA 13, was used between 1965 and 1970 for disposal of construction debris, stumps, and brush (McMaster et al., 1982; Biang et al., 1992). Landfill No. 9 was "reported to contain some oil (unknown quantity)" (McMaster et al., 1982, Table 2.2-3). Debris appears to have been dumped and pushed over the slope. The landfill is less than 1 acre in size and is located on the west side of Lake George Street near Hattonsville Road on the Main Post.

Unauthorized dumping appears to have continued after the dump was closed. In 1989, the Fort Devens Environmental Management Office observed and recommended the removal of recently disposed stumps, branches, steel fencing, plumbing fixtures and pipes. The landfill is currently closed to waste disposal.

SA 13 is surrounded by large trees (e.g., oak, red maple, ash, hickory), but no trees are growing on the landfill itself. Tree stumps, limbs, and trunks have been deposited on the surface of the landfill and down the steep lower slope. A wetland is located at the base of this slope. Site features are shown on Figure 2-12. Cross sections depicting subsurface information learned from test trenches are shown on Figures 2-13 and 2-14.

Nature and Extent of Contamination. The initial SI activities were conducted in July 1992 as part of the Group 2 field activities (ABB-ES, 1995). The investigation at SA 13 was designed to determine whether the waste material in the landfill, and past waste disposal practices, were adversely impacting environmental media at this SA. The program consisted of the collection of surface water and sediment samples, surface soil samples, subsurface soil samples, and installation and sampling of an upgradient groundwater monitoring well. Nitroglycerin, lead, and mercury were detected at elevated concentrations in surface water samples, while TPHC, PAHs, pesticides, and inorganics were detected at elevated concentrations in sediment. Pesticides, PCBs, PAHs, TPHC, and several inorganics were detected in cover soils. Pesticides and inorganic analytes were detected in subsurface soils. Elevated inorganic concentrations were detected in the upgradient well and in groundwater collected from the downgradient sumps.

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1 The SI concluded that a supplemental investigation was warranted at SA 13. A
2 Supplemental SI (ABB-ES, 1994a) was conducted to determine whether downgradient
3 groundwater and soil quality was being impacted by potential contaminants emanating
4 from the waste material. The results of the water samples collected from the sump during
5 the SI were deemed unrepresentative of shallow groundwater conditions. Therefore, two
6 shallow well points were installed in the wet area downgradient of the waste material and
7 samples of the shallow groundwater were collected and analyzed. In addition, one
8 subsurface soil sample from each of the well point borings was also collected and
9 submitted for laboratory analysis. Results of downgradient soil and groundwater sampling
10 did not indicate that the contaminants detected in the surface soil samples collected during
11 the SI have migrated to the soil at the base of the waste material or groundwater
12 downgradient of the site.

13
14 Predesign activities at this site included excavation of six test trenches to define the extent
15 and depth of landfilled material and to determine the composition of the waste. Cross
16 sections depicting subsurface information learned from test trenching are shown in
17 Figures 2-13 and 2-14. Trenches 13E-94-01X and 13E-94-02X were excavated on a
18 mound of soil originally thought to be part of the landfill. The soil encountered in these
19 trenches was loose, distinctly stratified sand and gravel typical of river or deltaic deposits.
20 There was no evidence of debris in either trench. Trenches 13E-94-03X through
21 13E-94-06X contained demolition debris, including lumber, asphalt, bricks, concrete, air
22 ducts, cable, angle iron, and sheet metal. The top 2 ft of test trench 13E-94-03X were
23 observed to consist of organic-rich gravelly sand fill containing limited debris. Below the
24 fill layer, a 2-ft layer of charred and burned lumber was observed, tapering off to the
25 northeast. Boulderly sand containing concentrated debris was observed beneath the
26 burned wood. Undisturbed soil was encountered approximately 8 ft bgs at the northeast
27 end of the trench, but the bottom of the landfill was not reached on the southwest side.
28 Test trenches 13E-94-04X and 13E-94-05X were excavated to define the west side of the
29 landfill. Trench 13E-94-04X exposed gravelly sand mixed and interlayered with lumber,
30 slabs of concrete, electric cable, sheet metal, and pipes. No evidence of burning was
31 apparent. The base of the debris unit contained concentrated roots, suggesting in-situ pre-
32 landfill ground surface, now buried. On the west side of the landfill, outside the limit of
33 debris, yellow till, similar to the undisturbed soil encountered at the bottom of
34 13E-94-03X, was observed. The waste within trench 13E-94-05X was similar to

1 13E-94-04X, but included a layer of burned wood similar to that found in 13E-94-03X.
2 On the east side of trenches 13E-94-04X and 13E-94-05X, debris extended below the
3 bottom of the 10- to 12-ft deep trenches. Trench 13E-94-06X, on the east side of the
4 landfill, contained similar layers of fill and debris as 13E-94-03X and 13E-94-05X. The
5 bottom of the landfill was encountered from 4 to 10 ft bgs. A water tank was discovered
6 approximately 7 ft bgs in this trench, and was removed. Groundwater was not
7 encountered in the trenches.

8
9 The water table was not encountered in test trenches at SA 13. Samples were not
10 collected for chemical analysis. The volume of waste was calculated electronically at
11 SA 13 by comparing pre-landfill and current topography. The volume was estimated at
12 10,000 cy (see Appendix B).

13
14 ABB-ES personnel also characterized the site to determine the wetland limits under state
15 or federal jurisdiction. A joint state/federal vegetated wetland lies north of an access road
16 adjacent to the SA 13 landfill. In most areas, a steep bank slopes down to the wetland
17 area. A small island of upland is located within the wetland. In addition, an intermittent
18 drainage ditch runs perpendicular to the wetland boundary; because no Bordering
19 Vegetated Wetland is associated with this intermittent stream, it is not considered a state
20 jurisdictional wetland.

21 22 23 **2.6 AREA OF CONTAMINATION 40 (GROUP 1A)**

24
25 Cold Spring Brook Landfill occupies approximately four acres along the edge of Patton
26 Road in the southeastern part of the Main Post. It extends for approximately 800 ft along
27 Patton Road and out into the former wetland along Cold Spring Brook, now mostly
28 submerged beneath Cold Spring Brook Pond (Figure 2-15). The upper surface of the
29 landfill slopes gently toward the north and east and varies in elevation from about 250 to
30 260 ft above sea level (ASL). The surface is densely covered with small trees and scrub,
31 the trees being predominantly pines. The edge of the landfill falls off abruptly to the
32 wetland or to the pond with an elevation drop that ranges between 10 and 20 ft. Based on
33 visual observations at the edge of the landfill, the bottom of debris is estimated by
34 ABB-ES to extend to approximately 237 ft ASL.

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SEA excavated eight test pits at AOC 40 in 1996 (SEA, 1996). The types of wastes observed by SEA were generally demolition debris and solid waste (i.e., wood, concrete, asphalt, metal, brick, wire, ash, stumps, and logs). Debris volume is estimated at 110,000 cy (see Appendix B). Cross sections showing estimated debris disposal depths are shown in Figures 2-16 and 2-17.

Aerial photographs showed that Patton Road formerly curved around the Cold Spring Brook wetland before realignment during the mid-to-late 1960s (Detrick, 1991, Figures 21, 22, and 23). Deposition of material at the landfill coincided with the realignment of Patton Road and apparently began very close to the edge of Patton Road. Based on terrain conductivity and magnetic survey data collected during the RI (E&E, 1993), Patton Road was interpreted to have been built on clean borrow material, and the landfill interpreted to extend north from the road embankment.

The elevation of the landfill along its southern edge is essentially the same as that of Patton Road. No roadside drainage ditch exists, and the existing surface of the landfill slopes down to the north toward the pond and toward the east at a rate of approximately 2 percent. Remnants of the old roadbed are still visible between well CSB-3 and Patton Road. South of the old roadbed is a flat area with little vegetation, that appears to have been excavated for gravel and sand. Beyond the apparent excavation area, a low hill covered with trees rises abruptly to about 350 ft ASL. Previous studies do not identify landfilling in this area.

Cold Spring Brook Landfill, considered abandoned, was identified in November 1987 when 14 55-gallon drums were discovered along the edge of Cold Spring Brook Pond. An identification number on the drums indicated that the original contents of several drums had been antifreeze manufactured by Union Carbide and that the drums were 15 to 20 years old. Apparently, the drums had been painted yellow and reused. A response team from a Union Carbide facility in New Hampshire examined the drums in March 1988, identified seven Union Carbide drums, and sampled their contents. Analysis revealed the presence of chlorinated solvents and some metals. Other wastes at the landfill included concrete slabs, wire, storage tanks, rebar, timber, and debris. No landfill hot spots or

1 suspect hazardous waste disposal areas were identified during RI or Supplemental RI
2 activities.

3
4 The 3.5-acre Cold Spring Brook Pond was created between 1965 and 1972 by the raised
5 inlet of the Patton Road culvert, as shown in aerial photographs from that period. The
6 pond has a surface elevation of approximately 240 ft ASL, and depth that ranges from
7 1 foot or less at its western end to a maximum of approximately 6 ft near its eastern end.

8
9 Patton Well, a water supply well for Devens, is located south of Patton Road, about
10 600 feet west of the landfill. Patton Well is screened from 46 to 76 ft bgs and appears to
11 tap the same aquifer as that monitored by several landfill wells. Patton Well operates on
12 an on-demand basis at approximately 800 gallons per minute (gpm). An ammunition
13 storage facility lies west of the pond, and Cold Spring Brook originates as drainage from a
14 wetland in the center of this area. The brook drains north to Grove Pond, passing through
15 several palustrine forested or scrub/shrub wetlands before reaching the pond.

16
17 The U.S. Army Environmental Hygiene Agency (USAEHA) completed a hydrological
18 investigation of Cold Spring Brook Landfill in 1988. The investigation showed that the
19 landfill is located over glacial sand and gravel deposits in, or adjacent to, a former
20 wetland. U.S. Geological Survey (USGS) information indicates the area is underlain by
21 swampy deposits of muck and peat, with adjacent units of sand and gravel from kame
22 deposits.

23
24 Eight wetland vegetative cover types were identified in the vicinity of Cold Spring Brook
25 Landfill during the RI through the completion of New England Division Army Corps of
26 Engineers (USACE) Wetland Delineation Data Forms (E&E, 1993). Each wetland cover
27 type meets the three criteria (i.e., hydrophytic vegetation, hydric soils, and wetland
28 hydrology) necessary to be classified as jurisdictional wetland. Interpreted wetlands
29 delineation is shown on Figure 2-18. No 100-year flood plain is located in the vicinity of
30 Cold Spring Brook Landfill.

31
32 Nature and Extent of Contamination. Three samples were collected from landfill cover
33 materials during the RI in 1991 and analyzed for Target Compound List (TCL) organics
34 and Target Analyte List (TAL) metals. PAHs (up to 2.6 micrograms per gram [$\mu\text{g/g}$]),

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1 and the pesticide residues 2,2-bis(para-chlorophenyl)-1,1-dichloroethane (DDD) (up to
2 0.10 µg/g) and 2,2-bis(para-chlorophenyl)-1,1,1-trichloroethane (DDT) (up to 0.23 µg/g),
3 were identified as cover soil contaminants. In addition, a number of inorganics were
4 reported above background concentrations and considered contaminants (E&E, 1993).
5 Cover soil was not sampled during the supplemental RI in 1992 (ABB-ES, 1993b).
6

7 Groundwater quality was characterized through two rounds of sampling at seven
8 monitoring wells during the RI, and two confirming rounds at 10 wells during the
9 supplemental RI.
10

11 The explosives 1,3,5-trinitrobenzene and 1,3-dinitrobenzene, detected in well CSB-1 at
12 7.94 micrograms per liter (µg/L) and 2.86 µg/L, respectively, were the only interpreted
13 organic contaminants in groundwater in the RI Report. Inorganics were interpreted as
14 contaminants in several wells, including upgradient/background wells (E&E, 1993).
15

16 Investigations during the Supplemental RI allowed refinement of the hydrogeologic model
17 for Cold Spring Brook Landfill and of the contamination assessment. The RI Addendum
18 Report concluded that monitoring wells CSB-3 and CSB-8 were upgradient of the landfill
19 and CSB-1, CSB-6, and CSB-7 were cross-gradient of the landfill. Wells CSM-92-02A
20 and CSM-92-02B, screened at and below the water table, respectively, were interpreted to
21 be slightly cross-gradient of groundwater flow at the western end of Cold Spring Brook
22 Landfill while monitoring wells CSB-2 and CSM-93-01A were interpreted as being
23 downgradient. Although located close to the upgradient edge of the landfill, the boring
24 log indicates that well CSB-8 is not constructed in landfill materials. Wells CSB-4 and
25 CSB-5 are located in a peat formation considered unrepresentative of a productive aquifer
26 and were not used during the contamination assessment.
27

28 Resurvey of Cold Spring Brook Landfill monitoring wells in March 1995 revealed several
29 errors in previous survey data that affected the previous interpretation of groundwater
30 flow. Specifically, the updated indicate that groundwater does not flow from Cold Spring
31 Brook Landfill toward Patton Well under non-pumping conditions, or during pumping
32 conditions of upto about 250,000 gallons per day.
33

The only Project Analyte List (PAL) organic detected in groundwater at Cold Spring Brook Landfill during supplemental RI sampling was bis(2-ethylhexyl)phthalate (BEHP), in the Round 1 sample from well CSM-93-02B at 14 µg/L. BEHP was undetected (i.e., <4.5 µg/L) in the three primary Round 2 samples, but was reported at 4.4 µg/L in the duplicate sample from well CSM-93-02B. The explosives 1,3,5-trinitrobenzene and 1,3-dinitrobenzene were not detected during Supplemental RI sampling.

Based on the distribution pattern for inorganics in unfiltered samples and comparison of data from filtered and unfiltered samples, the RI Addendum Report concluded that Cold Spring Brook Landfill is not a source of inorganic groundwater contamination.

The characterization of Cold Spring Brook Pond was accomplished during both the RI and Supplemental RI. The RI Report concluded that pond sediments were contaminated with the inorganics arsenic, lead, manganese, mercury, and zinc. Organic contaminants included PAHs (total concentration of 13 PAHs up to 79.6 µg/g), DDD (up to 1.29 µg/g), and 2,2-bis(para-chlorophenyl)-1,1-dichloroethene (DDE) (up to 0.202 µg/g) (E&E, 1993).

The RI Addendum Report concluded that pond sediments were contaminated with several PAHs, inorganics, and the pesticides DDD, DDE, and DDT. PAHs were detected most frequently and at the highest concentrations near the pond outlet. A second area of PAH contamination was also identified at the small cove near CSD-92-09X. Low concentrations of the pesticides DDD, DDE, and DDT were detected throughout the pond. The RI Addendum Report concluded that pond sediments are contaminated with arsenic, manganese, barium, iron, chromium, nickel, zinc, lead, and copper. The Final Feasibility Study Report (ABB-ES, 1994b) identified areas (Areas I and II on Figure 2-15), where sediment would be removed during remedial action.

2.7 AREA OF CONTAMINATION 41 (GROUP 1B)

Unauthorized Dumping Area (Site A) (AOC 41) is located on the South Post, approximately 0.5 mile west of the Still River Gate, on the north shore of New Cranberry Pond. This 0.14-acre dump was discovered by Fort Devens personnel. No record of its

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1 origin or use is known to exist, but it was observed that "...it appears that the site was
2 used up to the 1950s for disposal of nonexplosive military and household debris" (Biang et
3 al., 1992).

4
5 Most of the visible debris at the time of the SI consisted of rusted "cone-top" beer cans
6 (e.g., Harvard Ale, Boston Post Beer). Cone-top beer cans were manufactured between
7 1935 and the mid-1950s. Rusted vehicle fenders appeared by their shape to date
8 approximately from the 1910s or 1920s. No military debris was observed during the SI
9 (ABB-ES, 1995d).

10
11 The site is overgrown with trees and brush. Wetlands delineation, documented in
12 Appendix C, was performed by ABB-ES in June 1995. Site features are shown on
13 Figure 2-19. Cross sections depicting subsurface information from test excavations are
14 shown on Figures 2-20 and 2-21.

15
16 Nature and Extent of Contamination. The initial SI field activities were conducted by
17 ABB-ES in September 1992 as part of the Group 7 field activities. The objective of the SI
18 was to investigate the presence or absence of environmental contaminants in the different
19 environmental media found at the site, and to assess the vertical and horizontal distribution
20 of the contaminants. Samples of soil and groundwater were collected to characterize local
21 impacts from the dump. Surface water and sediment samples were collected for
22 laboratory analysis to assess potential downgradient impacts from the dump. TPHC,
23 PAHs, pesticides, and inorganic analytes were detected in surface soil samples collected
24 from the landfill. VOCs and inorganics were detected in groundwater samples.
25 Significant contamination was not detected in surface water; however, pesticide
26 compounds and inorganic analytes were detected in sediment samples.

27
28 The Supplemental SI was conducted to assess other potential sources of the groundwater
29 contamination detected during the SI, further define the hydrogeologic conditions, and
30 further investigate the potential for contaminant migration from the landfill waste material
31 to New Cranberry Pond. A surficial geophysical survey was conducted in the area directly
32 north of the debris disposal area to locate a source area of the chlorinated solvent
33 contaminants, detected in groundwater during the SI. Based on the results of the surveys,

1 no magnetic or ferrous metal anomalies were detected. These results indicate that there
2 did not appear to be a source area directly north of the waste material.

3
4 Three sediment samples were collected from the wet area at the base of the waste
5 material. No surface water samples were collected from these sampling points due to
6 insufficient surface water volumes at the time of sampling. Two surface water and
7 sediment pairs were collected from the northern side of New Cranberry Pond. The surface
8 water samples did not contain elevated levels of contaminants. Notable concentrations of
9 PAHs and lead were detected in sediment samples.

10
11 Groundwater samples were collected from the five newly installed monitoring wells and
12 the existing monitoring well in October 1993 and January 1994. VOCs and inorganics
13 were detected in these wells. Because the source of the VOCs in groundwater had not
14 been identified, an RI was conducted at AOC 41 (ABB-ES, 1996c).

15
16 The RI program for AOC 41 consisted of geophysical surveys, surficial and down-hole
17 UXO clearance, soil borings, test pits, subsurface soil sampling, monitoring well
18 installation and sampling, aquifer conductivity testing, and a survey of explorations to
19 attempt to locate the source and extent of groundwater contamination at the site. Because
20 groundwater contamination is being addressed as a separate operable unit at AOC 41, only
21 the test pit results from the RI program are discussed in the following paragraphs.

22
23 A total of nine test pits (41E-94-01X through 41E-94-09X) was excavated in and around
24 the landfill waste material, geophysical anomalies, and monitoring wells 41M-93-03X and
25 41M-94-03B. Up to three soil samples were collected from each test pit. Test pits
26 excavated within the landfill area (41E-94-01X through 41E-94-03X) indicated that debris
27 is primarily surficial. Cross sections depicting subsurface information from test pitting are
28 shown in Figures 2-20 and 2-21. Waste material observed in the test pits included
29 cone-top beer cans, glass bottles, and other scattered metal debris (e.g., car parts, water
30 cans). The glass appeared deformed, indicative of burning. Topsoil was observed in the
31 top 1 foot. A sand layer underlain by clay, was encountered from 1 to 7 ft bgs.
32 Groundwater was encountered in one test pit at a depth of approximately 10.5 ft bgs.
33 Groundwater has been observed at 13 ft bgs at the top of the slope and at 4 to 5 ft bgs at
34 the base of the landfill.

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1
2 Analytical results from the soil samples collected from these test pits indicated that no
3 SVOCs or TPHC were present in these samples. Trichlorofluoromethane was detected
4 consistently at low concentrations, but is not believed to be a site-related contaminant. It
5 was determined that the source of groundwater contamination detected at AOC 41 was
6 not the landfill. A ROD for AOC 41 groundwater (Horne, 1996 __) describes the selected
7 remedy (i.e., no formal remedial action). Long-term groundwater monitoring will be
8 conducted as part of the "no action" decision. To facilitate inclusion of AOC 41 into the
9 multi-site ROD, it was transferred to Group 1B from Group 7 prior to ROD preparation.

10
11 The inorganic results indicated that several inorganic analytes were detected above the
12 calculated Fort Devens background concentrations. Results of Toxicity Characteristic
13 Leaching Procedure (TCLP) testing indicated that detected concentrations of arsenic and
14 barium in the TCLP extract were below regulatory levels. These results suggest that the
15 waste and underlying soil at AOC 41 are not likely to be classified as hazardous. The
16 volume of waste is estimated to be 1,500 cy (see Appendix B).

3.0 RISK ASSESSMENT SUMMARIES

This section presents the potential human health and ecological risks for each of the seven debris areas. The information for each debris area was summarized from previous SI, Supplemental SI, RI, and FS reports as referenced. Table 3-1 presents an interpretation of information contained in this section. It includes the risk evaluation approach for each area of contamination, and the status of anticipated human health and ecological risks for each medium.

3.1 SUMMARY OF HUMAN HEALTH RISK ASSESSMENTS

The following subsections summarize the human health risk evaluation/assessment results for the debris areas.

3.1.1 Study Area 6

Previous investigations at SA 6 consisted of only predesign activities. A PRE or risk assessment was not performed, because SI or RI activities were not conducted at SA 6. However, observations made during predesign activities indicate that SA 6 contains only household debris, primarily metal and glass, dating from the late 1700s to the early 1900s. Military-type waste was not observed. Human health risk evaluations were not performed for SA 6; however, due to the relatively small volume and nature of the observed waste at this site, risks to potential human receptors at SA 6 are expected to be minimal.

3.1.2 Area of Contamination 9

The human health PRE presented in the SI Report for AOC 9 (ABB-ES, 1996b) evaluated potential human health risks associated with exposure to site contaminants in surface soil, subsurface soil, groundwater, surface water, and sediment.

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1 Citing no evidence or reason to conclude that AOC 9 landfill contents are causing
2 significant environmental contamination or threat to human health and the environment, a
3 No Further Action Decision under CERCLA document (ABB-ES, 1993a) was submitted
4 by the Army to USEPA, Region I. USEPA did not concur with the decision to remove
5 AOC 9 from the CERCLA process, stating that levels of certain organic and inorganic
6 analytes in groundwater were detected above Maximum Contaminant Levels (MCLs), and
7 appear to be outside USEPA's acceptable target risk range for unrestricted future use. As
8 a result, AOC 9 was added by the Army to the group of landfills being considered for
9 remediation in this FS report.

10
11 **Surface Soil.** Three inorganic compounds (i.e., copper, lead, and nickel) were detected in
12 surface soil at concentrations above base-wide background levels; however,
13 concentrations were well below USEPA Region III residential soil concentrations.
14 Although arsenic was detected at a concentration above the USEPA Region III residential
15 soil concentration, it did not exceed the base-wide statistical background concentration.

16
17 **Subsurface Soil.** Organic compounds detected in AOC 9 subsurface soil consisted
18 mostly of PAHs. Of the sixteen detected PAHs, the maximum detected concentrations of
19 six exceeded the USEPA Region III commercial/industrial soil concentrations.

20
21 Although several inorganic compounds were detected in AOC 9 subsurface soil at
22 concentrations above base-wide statistical background concentrations, only two
23 compounds (i.e., arsenic and beryllium) were present at concentrations above the USEPA
24 Region III commercial/industrial soil concentrations. In the case of arsenic, the maximum
25 detected concentration was equal to the base-wide statistical background concentration.
26 Although the maximum beryllium concentration exceeded the USEPA Region III
27 commercial/industrial concentration, the exceedance was slight.

28
29 **Groundwater.** Two organic analytes, chloroform and TPHC, were detected in AOC 9
30 monitoring wells. Chloroform was detected once in Round 1 at a concentration below the
31 Massachusetts drinking water guideline for chloroform. TPHC was detected in three out
32 of ten samples, once in Round 1 and twice in Round 2. No federal drinking water
33 standard or guideline exists for TPHC, so concentrations were compared to proposed

1 Massachusetts Contingency Plan (MCP) GW-1 guidance values. The detected
2 concentrations were only slightly greater than the proposed guidance value. All
3 concentrations of TPHC were detected in locations outside and upgradient of the landfill
4 boundary.

5
6 Inorganic analytes were detected above background in virtually all groundwater samples
7 collected from up-, down-, and cross-gradient AOC 9 monitoring wells. The maximum
8 detected concentrations of eight of the 18 inorganic analytes exceeded their respective
9 drinking water standard or guideline. The eight analytes were aluminum, arsenic,
10 chromium, cobalt, iron, lead, manganese, and nickel.

11
12 Filtered samples collected during Round 2 showed significant reductions in the
13 concentrations of these analytes. Therefore, elevated concentrations of inorganics were
14 believed to be the result of suspended materials in the unfiltered groundwater samples.
15 For chromium, lead, and nickel, the concentrations of four out of four filtered samples
16 were below the respective drinking water standard or guideline. For aluminum, arsenic,
17 and iron, the concentrations of three out of four filtered samples were below drinking
18 water standards or guidelines. Cobalt was not detected above the detection limit in four
19 out of four filtered samples. For manganese, the concentrations of two out of four filtered
20 samples were below the USEPA secondary MCL for manganese.

21
22 **Surface Water.** Of the eight analytes detected in the surface water in this area, only two
23 (i.e., BEHP and iron) were detected at concentrations above their respective drinking
24 water standards and guidelines. BEHP was detected in one of three samples at a
25 concentration only slightly above the USEPA Region III tap water concentration. Iron
26 was detected in three of three samples at concentrations above the USEPA secondary
27 MCL for iron. The magnitude and frequency of exposure to surface water in this area
28 would be expected to be much less than that upon which the drinking water guidelines are
29 based. The use of drinking water guidelines for comparison to surface water
30 concentrations is a conservative approach and was used due to a lack of available health-
31 based guidelines for exposure to surface water.

32
33 **Sediment.** Of 13 analytes detected in sediments, arsenic is the only one that has
34 concentrations exceeding USEPA Region III residential soil concentrations. The USEPA
35 Region III residential soil concentration is designed to be protective for exposures that

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could occur 350 days per year for a residential lifetime of 30 years. Arsenic, therefore, is not expected to pose a significant human health risk in the sampled swampy area, because exposure to sediment in this area would be much less than that expected in a residential setting.

3.1.3 Area of Contamination 11

The baseline human health risk assessment (RA) presented in the Draft RI Report for AOC 11 (Arthur D. Little, Inc. [ADL], 1995) evaluated potential human health risks associated with exposure to site contaminants in surface soil, surface water and sediment. Although uncertainties are associated with the risk assessment, conservative exposure parameters and model inputs were selected for calculation of risk, resulting in conservative estimates of potential site-related risks.

Surface Soils. Risks were calculated for recreational exposures to adults and children including incidental ingestion and dermal contact. Cancer risks related to incidental ingestion for the average and maximum exposure scenarios are all equal or below 1×10^{-6} . No individual contaminants of concern (COCs) contribute greater than 1×10^{-6} to the incremental cancer risk from incidental ingestion. For potential dermal exposures, no cancer risks were calculated due to a lack of recommended absorption values or published toxicity values for the COCs.

The noncancer hazard index (HI) for all scenarios is less than 1. The results show that no adverse, noncancer, health effects are likely to occur from exposure to these surface soils.

Surface Water. Risks associated with Nashua River surface water were calculated based on adult and child swimming scenarios (i.e., incidental ingestion and dermal contact). Risks associated with surface water in the Northern and Southern Wetlands were based on adult and child wading scenarios (i.e., dermal contact). Carcinogenic risks for incidental ingestion of Nashua River surface water were below the USEPA's guidance range of 1×10^{-6} to 1×10^{-4} . Noncancer risks for incidental ingestion of Nashua River surface water were also below guidance values.

1 Total cancer risks associated with dermal contact with Nashua River surface water are
2 below the USEPA guidance for average concentrations, and within the guidance range for
3 maximum concentrations. Only BEHP has an individual cancer risk that exceeds the
4 lower value of the range. Cancer risks are also within the USEPA risk range for dermal
5 contact with surface waters from the Northern and Southern Wetland. In the Northern
6 Wetland, the risk is primarily due to concentrations of DDD, DDT, and arsenic. In the
7 Southern Wetland, DDD and DDT are the primary contributors to risk.

8
9 Noncancer risks associated with dermal contact of surface water in all three locations are
10 less than the USEPA guidance value of 1. This indicates that noncancer health effects are
11 unlikely to occur as a result of this exposure level.

12
13 **Sediment.** Risks associated with sediment from the three locations were calculated based
14 on adult and child dermal contact scenarios. Estimated cancer risks for dermal contact
15 with sediment in the Nashua River were equal to the low limit of the guidance range, and
16 no individual COC exceeded this range. The cancer risk was associated with potential
17 exposure to Aroclor 1016, Aroclor 1254, and Aroclor 1260. Because inorganic COCs do
18 not have recommended dermal absorption values or published toxicity values, estimated
19 cancer risks for Northern and Southern Wetland sediments were not calculated.

20
21 Noncancer HIs do not exceed 1 for dermal contact with sediment in the Nashua River,
22 Northern Wetland, or Southern Wetland, indicating that noncancer health effects are
23 unlikely to occur when individuals contact these sediments.

24 25 **3.1.4 Study Area 12**

26
27 The human health PRE presented in the Revised Final SI Report for SA 12 (ABB-ES,
28 1995d) evaluated potential human health risks associated with exposure to site
29 contaminants in surface soil, groundwater, and sediment. The Final SI Report for SA 12
30 (ABB-ES, 1993a) evaluated potential human health risks associated with surface water.
31 The future use of SA 12 was assumed to be residential for purposes of the PRE.

32
33 **Surface Soil.** Surface soils at SA 12 were collected from stained surficial soils and
34 shallow soil depths. The levels of detected organic analytes in the surface soil were below

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1 the USEPA Region III residential soil concentrations, with the exception of Aroclor 1254.
2 However, Aroclor 1254 was detected in only one of the nine samples collected.

3
4 Of the eight inorganic analytes detected above the base-wide statistical background
5 concentrations, two analytes (i.e., beryllium and lead) were detected at concentrations
6 above their respective health-based soil guideline. Lead was detected at concentrations
7 exceeding the USEPA Superfund lead cleanup level; however, this exceedance occurred in
8 only one sampling location. Beryllium concentrations exceeded USEPA Region III
9 residential soil concentrations in three of nine samples. One additional inorganic analyte
10 (i.e., arsenic) was detected at concentrations above the USEPA Region III residential soil
11 concentrations. However, the maximum arsenic concentration did not exceed the base-
12 wide statistical background concentration. Based on this screening-level analysis, it
13 appeared that beryllium and lead may pose a potential risk to human health at the reported
14 sampling locations, the area of stained surficial soils.

15
16 **Groundwater.** Unfiltered groundwater samples from four downgradient sump locations
17 were used to assess the impact of the landfill on groundwater. Of the two organic
18 compounds (i.e., BEHP and chloroform) detected in groundwater associated with SA 12,
19 only BEHP concentrations exceeded a drinking water standard. BEHP was detected in
20 one of six samples at a concentration only slightly above the USEPA Region III tap water
21 concentration, and therefore was not believed to pose a significant human health risk.

22
23 When comparing inorganic concentrations to the base-wide statistical background
24 concentrations, significant exceedances included: aluminum, arsenic, chromium, copper,
25 iron, lead, manganese, mercury, and zinc. Seven inorganic analytes were detected at
26 concentrations above their drinking water standard/guideline. Aluminum, iron, and
27 manganese were detected in six of six samples collected and each average concentration
28 exceeded its respective USEPA secondary MCL. Beryllium, antimony, and cadmium
29 were detected in one of six samples and the detected concentration of each contaminant
30 exceeded its respective drinking water standard/guideline. In addition, the maximum and
31 average concentrations of lead exceeded the USEPA lead action level.

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1 A filtered sample was collected during Round 2 sampling. A comparison of the filtered
2 and unfiltered samples indicated that high TSS levels may have been responsible for the
3 high levels of some inorganic analytes, such as aluminum, calcium, iron, potassium,
4 magnesium, and manganese. Based on the screening-level analysis, it appeared that lead
5 and possibly beryllium, antimony, and cadmium, may have posed a potential risk to human
6 health at the reported sampling locations.

7
8 **Surface Water.** One organic compound, BEHP, was detected below its USEPA
9 Region III tap water concentration in surface waters associated with SA 12. Five
10 inorganic analytes were detected in surface waters at concentrations that exceeded their
11 respective drinking water standard/guideline. The maximum concentration of lead was
12 three times the USEPA lead action level and the average concentration slightly exceeded
13 the action level. Aluminum, iron, and manganese were detected in all samples collected
14 and each exceeded its respective USEPA secondary MCL. The maximum concentration
15 of arsenic exceeded the Massachusetts drinking water guideline; however, the average
16 concentration in the four surface water samples did not.

17
18 The use of drinking water guidelines for comparison to surface water concentrations in a
19 wetland or river is a conservative approach used due to a lack of available health-based
20 guidelines for surface water exposure. Because exposure to surface waters in the future is
21 anticipated to be restricted to wading, it is not likely that an individual would encounter
22 inorganic concentrations that would pose a public health threat.

23
24 **Sediment.** Several organic analytes were detected in sediment samples, including:
25 pesticide residues, PAHs, PCBs, acetone, and BEHP. Acetone and BEHP are common
26 laboratory contaminants and were not considered to be SA-related contaminants. The
27 levels of all PAHs detected in the sediment were below the MCP S-2/GW-1 soil standards
28 and the USEPA Region III residential soil concentrations. Detected concentrations of
29 DDT and its breakdown products were also below Region III residential soil
30 concentrations.

31
32 Aroclor 1248 and Aroclor 1260 were the detected PCBs. The maximum detected
33 concentrations of Aroclor 1248 and Aroclor 1260 exceeded the Region III residential soil
34 concentration for PCBs.

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1 Of the inorganic analytes detected in the sediment, antimony, arsenic, cadmium, and lead
2 exceed their respective USEPA Region III residential soil concentration. However, these
3 compounds are not expected to pose a significant health risk in the sampled areas because
4 exposure to sediment in these areas would be much less than that expected in a residential
5 setting.

6 7 **3.1.5 Study Area 13**

8
9 The human health PRE presented in the SI Report for SA 13 (ABB-ES, 1995d) evaluated
10 potential human health risks associated with exposure to site contaminants in surface soil,
11 groundwater, surface water, and sediment. The landfill is not currently in use, however,
12 the future use of SA 13 was assumed to be residential for purposes of the PRE.

13
14 **Surface Soil.** The levels of detected organic analytes in surface soil are below the
15 USEPA Region III residential soil concentrations, with the exception of four PAHs.
16 These four PAHs only slightly exceed their respective USEPA Region III residential soil
17 concentrations and each was detected in only one of four samples collected.

18
19 Of the 13 inorganic analytes detected above the base-wide statistical background
20 concentrations, two were detected at concentrations above their respective health-based
21 soil guideline; arsenic and beryllium. Only the maximum detected concentration of arsenic
22 exceeds the base-wide background concentration. The maximum and average
23 concentrations of beryllium are above the USEPA Region III residential soil
24 concentration. Elevated concentrations of inorganics were identified primarily in the
25 visually contaminated soil directly on top of the landfill.

26
27 **Groundwater.** A comparison of unfiltered groundwater concentrations to the Devens
28 background indicated that the maximum detected concentration of every analyte exceeded
29 background concentrations. Four of these detections were at concentrations above their
30 respective drinking water standard or guideline. Aluminum, manganese, and iron had
31 average concentrations that exceeded their respective USEPA secondary MCL. The
32 maximum detected concentration of lead exceeded the lead action level; however, the
33 average concentration did not exceed the action level.

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1
2 The filtered samples, in general, showed significantly lower concentrations than the
3 unfiltered samples. In the four filtered samples, the concentrations of aluminum, lead, and
4 iron were below detection limits, and the concentration of manganese dropped below the
5 secondary MCL. Based on the filtered sample data, the high inorganic concentrations
6 detected in the unfiltered groundwater samples appear to have been associated with
7 suspended solids in the samples, not landfill contamination. Therefore, groundwater at
8 SA 13 was not believed to pose a risk to human health.

9
10 **Surface Water.** Two organic compounds were detected in the surface waters associated
11 with SA 13, BEHP and nitroglycerine. BEHP is a common laboratory contaminant and
12 was not considered to be a SA-related contaminant. Nitroglycerine was detected in one of
13 four samples at a concentration that exceeded the USEPA Lifetime Health Advisory.

14
15 The concentrations of four inorganic analytes that were detected in the surface water
16 exceed their respective drinking water standard/guideline. Aluminum, iron, and
17 manganese were detected in all samples collected and each exceeded their respective
18 USEPA secondary MCL. Only the maximum concentration of lead exceeded the USEPA
19 action level.

20
21 The use of drinking water guidelines for comparison to surface water concentrations is a
22 conservative approach and is used due to a lack of available health-based guidelines for
23 exposure to surface water. The magnitude and frequency of exposure to surface water
24 associated with SA 13 would be expected to be much less than that upon which drinking
25 water guidelines are based. Because exposure to surface waters in the wetlands is
26 anticipated to be restricted to wading in the future, it is not likely that an individual would
27 encounter concentrations that would pose a threat to the individual's health.

28
29 **Sediment.** Several organic contaminants were detected in sediment samples collected
30 from the wetland area southwest of SA 13; however, the levels of all detected organics are
31 below the USEPA Region III residential soil concentrations. Of the inorganic analytes
32 detected in sediment, only arsenic and beryllium exceed their respective USEPA
33 Region III residential soil concentration. The concentrations of arsenic and beryllium
34 detected in sediment are not expected to pose a significant health risk in the sampled area
35 because exposure to sediment in this area would be much less than that expected in a

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1 residential setting. The use of residential soil concentrations for comparison to sediment
2 concentrations is a conservative approach used due to a lack of available health-based
3 guidelines.

3.1.6 Area of Contamination 40

6 A Supplemental Risk Assessment was performed for Cold Spring Brook Landfill and
7 presented in the Final RI Addendum Report (ABB-ES, 1993b) to evaluate potential
8 human health risk associated with exposure to site contaminants in surface soil and
9 groundwater, and sediment.

11 **Fish Sampling Program.** Fish tissue analyses obtained through the October 1992 fish
12 sampling program provided measured chemical of potential concern (CPC) concentrations
13 in fish. The health risks faced by a recreational fisherman or family member who
14 consumes fish from Cold Spring Brook Pond fell within the USEPA target risk range.
15 The maximum detected concentrations of mercury, DDE, and DDD in the fish at Cold
16 Spring Brook Pond were also below their respective U.S. Food and Drug Administration
17 action levels.

19 **Surface Soil.** The health risks associated with contact with surface soil at Cold Spring
20 Brook Landfill are below the USEPA cancer risk guidance value of 1×10^{-6} and target HI
21 of 1. Under current land use conditions, an adult and child are assumed to be exposed to
22 soil by dermal contact and incidental ingestion five days per year for 30 and 5 years,
23 respectively. The health risks associated with surface soil exposure under future assumed
24 residential conditions (350 days/year) are within the USEPA carcinogenic guidance range
25 of 1×10^{-6} to 1×10^{-4} , and below the noncancer HI of 1.

27 **Groundwater.** Based on the groundwater sampling data from the March and June 1993
28 sampling rounds, cancer risks associated with future residential use of the unfiltered
29 groundwater exceeded the USEPA points of departure and USEPA target risk range.
30 Arsenic accounted for approximately 99 percent of the total risk. The cancer slope factor
31 for inorganic arsenic is thought by many to overestimate the true cancer risk by as much as
32 an order of magnitude relative to risk estimates associated with most other carcinogens.
33

Two additional analytes, BEHP and manganese, presented risks above the points of departure. The hazard quotients (HQs) for manganese ranged from 16 to 37. BEHP presented cancer risks slightly above the point of departure (at 6.5×10^{-6}).

Although these risks are above USEPA guidance values, they were estimated based on residential exposure to groundwater under future land use conditions. Because there is no residential groundwater exposure under current land use conditions there is no associated carcinogenic risk. In addition, the noncancer risks associated with manganese in drinking water may be overestimated due to the uncertainty and limitations of the one epidemiological study upon which the reference dose (RfD) for manganese is based.

In comparing the March and June 1993 sampling results to drinking water standards, the maximum detected concentrations from the March and June 1993 sampling rounds of aluminum, iron, and manganese exceeded their Secondary MCLs. The federal and state guidelines for sodium in drinking water were also exceeded. The primary MCL for BEHP of 6 $\mu\text{g/L}$ was exceeded only by its maximum detected concentration of 14 $\mu\text{g/L}$; the average concentration of 4 $\mu\text{g/L}$ was below the MCL.

Surface Water. During the RI, risks were calculated based on the scenario of incidental ingestion of surface water while fishing in Cold Spring Brook Pond. This exposure route did not present health risks above the Superfund points of departure. Although not evaluated as a potential exposure pathway in the risk assessment, the health risks from contact with the pond surface water while swimming were expected to be low. A comparison of the average and maximum concentrations of analytes in surface water to drinking water standards and guidelines showed the detected concentrations of all compounds except iron and manganese to be below standards. Because iron has a relatively low toxicity for humans, and the average concentration of manganese is below its Maximum Contaminant Level Goal, health risks are expected to be low.

Sediment. In the Supplemental Risk Assessment, direct contact with sediment presented cancer risks within the USEPA target risk range of 1×10^{-6} to 1×10^{-4} for both current and future land use conditions.

The health risks from lead in Cold Spring Brook Pond sediment could not be estimated quantitatively; however, the concentrations of lead in sediment were evaluated using the

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1 USEPA interim soil cleanup level for lead in residential settings of 500 µg/g. Although
2 the maximum detected concentration of lead in Cold Spring Brook Pond sediment was
3 above the soil lead cleanup level, the average concentration was below the soil lead
4 cleanup level. Exposure to lead in sediment was also predicted to be much less than in a
5 residential setting. Therefore, lead in sediment was not predicted to pose a significant
6 health risk.

7 8 **3.1.7 Area of Contamination 41**

9
10 The human health PRE presented in the SI Report for AOC 41 (ABB-ES, 1995d)
11 evaluated potential human health risks associated with exposure to site contaminants in
12 surface soil, groundwater, surface water, and sediment. Subsequent to the SI and
13 Supplemental SI, investigation of groundwater contamination at AOC 41 was conducted
14 under a separate operable unit from that of the other media. The recently completed RI
15 for AOC 41 (ABB-ES, 1996c) focused on the groundwater operable unit only; however,
16 test pits were completed in the waste material to determine whether the waste is a source
17 of groundwater contamination at this AOC. Data from collected soil samples indicated
18 that the waste material is not the source of groundwater contamination. Because
19 groundwater contamination is being addressed as a separate operable unit and is not
20 related to debris at this AOC, only the potential human health risks associated with
21 exposure to site contaminants in surface soil, surface water, and sediment are summarized
22 in this subsection. For purposes of the PRE, it was assumed that future use of AOC 41
23 would be residential. It is highly unlikely that private residences would be built near
24 AOC 41.

25
26 **Surface Soil.** Surface soil samples at AOC 41 were collected from areas of stained soils
27 and from shallow soil depths. The levels of detected organic analytes in surface soil were
28 below the USEPA Region III residential soil concentrations, with the exception of four
29 PAHs. Only the maximum detected concentrations of the four PAHs exceeded the
30 USEPA Region III residential soil concentrations, and the exceedances were generally
31 slight.
32

1 An assessment of the inorganic data for AOC 41 surface soils showed elevated inorganic
2 contamination in the visually stained soils directly on top of the waste material. Shallow
3 soil samples showed few exceedances. Of the 12 inorganic analytes detected above the
4 base-wide statistical background concentrations, two were detected at concentrations
5 above their respective health-based soil guideline. Beryllium was detected above the
6 USEPA Region III residential soil concentration, and lead exceeded the USEPA
7 Superfund lead cleanup level at two of 10 sampling locations. One additional inorganic
8 analyte, arsenic, was detected at concentrations above the USEPA Region III residential
9 soil concentration; however, the maximum arsenic concentration did not exceed the base-
10 wide statistical background concentration.

11
12 During the Supplemental SI, three surface soil samples were collected from the low area
13 at the base of the waste material. Several PAHs, acetone, di-n-butylphthalate, and
14 Aroclor 1260 were detected in the samples. Five of the PAHs, each detected in only one
15 of four samples, exceeded either the USEPA Region III residential soil concentrations
16 and/or the MCP S-2/GW-1 soil standard. Aroclor 1260 was detected in all four samples
17 at concentrations above the residential soil concentration but below the MCP S-2/GS-1
18 soil standard. Arsenic was the only inorganic detected above health screening guidelines;
19 however, the concentration is below the basewide background level for arsenic. It
20 appears, based on these comparisons, that only the PAHs presented a potential risk under
21 a residential setting.

22
23 **Surface Water.** Two organic compounds, toluene and dichloroethane (DCA) were
24 detected in surface waters associated with AOC 41. The maximum concentrations of both
25 were below their respective primary drinking water MCLs.

26
27 The concentrations of four inorganic analytes that were detected in the surface water
28 exceed their respective drinking water standard/guideline. The average concentration of
29 lead detected in New Cranberry Pond exceeds the USEPA lead action level. Aluminum,
30 iron, and manganese were detected in all samples collected and each exceeded its
31 respective USEPA secondary MCL. The use of drinking water guidelines for comparison
32 to surface water concentrations is a conservative approach and was used due to a lack of
33 available health-based guidelines for exposure to surface water. Because exposure to
34 surface water was expected to be restricted, it is unlikely that contaminants would pose a
35 significant threat to public health.

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Sediment. Several organic analytes were detected in sediment samples: pesticide residues, acetone, chloroform, and Aroclor 1260. Acetone and chloroform are common laboratory contaminants and were not considered to be SA-related. The levels of all pesticide residues detected in sediment were below the USEPA Region III residential soil concentrations and MCP S-2/GW-1 soil standards. The concentration of Aroclor 1260 exceeded the Region III residential soil concentration, but not the MCP S-2/GW-1 soil standard.

Of the inorganic analytes detected in sediment, only arsenic exceeds its respective USEPA Region III residential soil concentration but not the MCP S-2/GW-1 soil standard. Concentrations of contaminants detected in sediment are not expected to pose a significant health risk in the sampled area because exposure to sediment in this area would be much less than expected in a residential setting.

3.2 SUMMARY OF ECOLOGICAL EVALUATIONS AND RISK ASSESSMENTS

The following subsections discuss the ecological risk evaluation/assessment results for the debris areas. The ecological PREs contained in the SI reports for AOC 9, SA 12, SA 13, and AOC 41 are summarized, as are the ecological risk assessment contained in the RI reports for AOC 11 and AOC 40, to provide a broad overview of potential ecological risks associated with the debris areas.

3.2.1 Study Area 6

As discussed in Subsection 3.1.1, the risk to potential human receptors at SA 6 are expected to be minimal because of the relatively small volume and nature of the waste at this site. The same conclusion can be applied to potential ecological receptors.

3.2.2 Area of Contamination 9

The ecological PRE presented in the SI Report for AOC 9 (ABB-ES, 1996a) evaluated potential ecological risks associated with exposure to site contaminants in surface soil, surface water, and sediment.

Surface Soil. The inorganic analytes copper, lead, and nickel were detected above background in two surface soil samples taken from test pits on the AOC 9 landfill. A screening-level evaluation of the potential effects from surface soil exposure was conducted by comparing the maximum concentrations of these contaminants to their respective protective contaminant levels (PCLs). The maximum concentrations of copper and nickel were less than their respective PCLs, and the maximum concentration of lead was greater than the PCL, which was established to be the background concentration.

Although lead exceeded the PCL, it was not considered to pose ecological risks to terrestrial receptors at the site for several reasons: (1) the maximum lead concentration is less than twice the background value; (2) areas of unvegetated terrestrial habitat, that are unsuitable for foraging, exist at the AOC 9 landfill; and (3) PCLs derived for other receptors are at least an order of magnitude above the detected lead concentrations at AOC 9.

Surface Water. Several inorganic compounds were detected and chosen as COCs from three surface water samples taken from wetlands located to the southeast of the AOC 9 landfill. Risks to aquatic receptors in wetlands surface water were evaluated through direct comparison of maximum concentrations to aquatic benchmark values. Concentrations of aluminum, lead, and iron detected above Federal Ambient Water Quality Criteria (AWQC) were most likely reflective of background conditions rather than landfill-related conditions. Concentrations of aluminum and lead, although above the chronic AWQC, were lower than the acute AWQC. In addition, a review of AWQC documents indicated that early life stages of trout are among the most sensitive ecological receptors. Because the site's ecological receptors are likely to be more tolerant of contamination, it is unlikely that the low levels of contamination in surface water will have an adverse effect on receptors.

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1 **Sediment.** Maximum lead and arsenic concentrations in wetlands sediments exceeded the
2 screening level benchmark toxicity values. The average lead concentration is identical to
3 the New York State Department of Environmental Conservation (NYSDEC) sediment
4 quality guideline and less than the Natural Oceanic and Atmospheric Administration
5 (NOAA) effects range-low (ER-L) value (Long and Morgan, 1990). Therefore, lead is
6 not considered to be causing significant ecological risk at AOC 9. The average arsenic
7 concentration is only slightly greater than the NYSDEC sediment quality guideline and is
8 considerably less than the ER-L of NOAA (Long and Morgan, 1990). Therefore, arsenic
9 is not considered to be causing any significant ecological risk at AOC 9.

11 3.2.3 Area of Contamination 11

12
13 The Ecological Risk Assessment presented in the Draft RI Report for AOC 11 (ADL,
14 1995) evaluated potential ecological risks associated with exposure to site contaminants in
15 surface soil, surface water, and sediment.

16
17 **Surface Soils.** Exposure risks are expected to be moderate for cadmium and high for lead
18 from dietary exposures in the AOC-11 disposal area. These risks, however, are based on
19 conservative scenarios of restricted foraging entirely within the 2-acre habitat found on the
20 debris disposal area surface, and are therefore, likely overestimated. Maximum debris
21 disposal area soil exposure risks are expected to be low for other COCs, essentially
22 identical to those for the Devens' soil background.

23
24 **Surface Water.** Surface water risks associated with the Northern and Southern wetlands,
25 are elevated due to the presence of metals and pesticides, although the wetlands do not
26 appear to have been functionally impaired and do not exhibit obvious stress symptoms.
27 Surface water risks associated with the Nashua River are insignificant and do not increase
28 adjacent to or downstream of AOC 11.

29
30 The results of toxicity tests performed on the downstream wetlands indicated that
31 wetlands surface water samples are not toxic to test organisms. Similar tests revealed the
32 same results in samples collected from the upstream wetlands. These test results failed to
33 indicate any toxicity that is strictly associated with AOC 11 wetland surface waters.

Sediment. Both AOC 11 wetlands exhibit high average and maximum, noncarcinogenic sediment risks for metals and pesticides, with pesticides accounting for most of the risk. However, with the exception of the maximum detected levels of a few COCs, most of the wetland risks do not significantly exceed those observed in the upstream reference wetland located within the same, western floodplain as the AOC 11 wetlands. This information suggests that the contamination is likely reflecting historical and continuing inputs from over-bank flooding by the Nashua River rather than current site conditions. The results of toxicity tests indicate that, in general, the wetlands sediment samples are not toxic to most of the test organisms. The tests fail to indicate any toxicity that was strictly associated with the AOC 11 wetlands.

Most of the aquatic ecological risks in the Nashua River are attributed to sediment contamination with metals and pesticides. Significant incremental risk increases occur in river sediments adjacent to AOC 11 for several metals and pesticides. Since these increases do not appear to be related to current surface water influx of suspended sediments from AOC 11 wetlands to the river, the increase may be due to historical sediment releases from the wetlands during infrequent high-flow events and/or subsurface migration of inorganics via groundwater flow from the AOC 11 refuse area. The occurrences may also reflect local variation in these contaminant concentrations along the entire length of the Nashua River.

The elevated risk levels in the AOC 11 wetlands are not clearly attributed, at least solely, to contaminants derived from AOC 11. Rather, periodic over-bank flooding of the Nashua River appears to have contributed a portion of the metal and pesticide contamination found in both the AOC 11 and upstream wetlands, while the wetlands appear to be retarding contamination influx to the Nashua River. Remedial action within these wetlands could exacerbate existing river contamination by resuspending sediment-sorbed contaminants into the water and releasing them into the river.

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3.2.4 Study Area 12

The ecological PRE presented in the Revised Final SI Report for SA 12 (ABB-ES, 1995d) evaluated potential ecological risks associated with exposure to site contaminants in surface soil, and sediment. The Final SI Report for SA 12 (ABB-ES, 1993a) evaluated potential ecological risks associated with surface water.

Surface Soil. The maximum concentrations of barium, lead, zinc, and Aroclor 1254 exceeded their respective surface soil benchmark values used for the screening-level evaluation. The maximum detected concentration of lead was approximately 18 times its benchmark value. Aroclor 1254, detected in only one sample, was approximately twice the benchmark value established for this PCB. The maximum barium and zinc concentrations were approximately 4 and 6 times their respective surface soil benchmark values. This information suggests possible adverse effects to ecological receptors from surface soil contamination in the landfill area.

Surface Water. Risks to aquatic receptors in wetlands surface waters were evaluated through comparison of maximum concentrations to aquatic benchmark values. The maximum concentrations of aluminum, chromium, copper, iron, lead, and zinc in SA 12 floodplain surface water exceeded their respective aquatic benchmark values. Generally the USEPA chronic AWQC was used as the benchmark value. The maximum detected concentration of aluminum was approximately 13 times the chronic AWQC and the maximum detected concentration of iron was approximately 74 times the chronic AWQC. Maximum concentrations of chromium, copper, lead, and zinc were all several times higher than their respective aquatic benchmark values. These values suggest possible adverse effects to ecological receptors from surface water contamination; however, the concentrations of inorganics detected in Nashua River surface waters are most likely representative of background surface water conditions and are not site related.

Sediment. The pesticides DDD and DDE were both detected at concentrations approximately an order of magnitude greater than their total organic carbon (TOC)-normalized benchmark values. Aroclor 1248 and BEHP were detected at maximum concentrations that were approximately twice their respective sediment benchmark values.

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1
2 The maximum concentrations of 11 inorganic and four organic analytes in floodplain
3 sediments exceeded their respective sediment benchmark values. Antimony, arsenic,
4 cadmium, chromium, copper, iron, lead, mercury, nickel, silver, and zinc in wetlands
5 sediment were all detected at levels greater than their sediment benchmark values. The
6 maximum detected concentration of arsenic was approximately 15 times its benchmark
7 value, while cadmium was detected at approximately 270 times its benchmark value. The
8 maximum detected concentration of chromium was approximately 13 times its benchmark
9 value and the maximum concentration of copper was approximately 27 times its
10 benchmark value. Lead and mercury were both detected at maximum concentrations
11 approximately 30 times their sediment benchmark values. The maximum concentrations
12 of the inorganic analytes in the Nashua River floodplain sediment may be the most
13 significant contributors to ecological risk in the vicinity of SA 12; however, these
14 concentrations are most likely representative of Nashua River surface water conditions
15 and are not site related.

16 17 **3.2.5 Study Area 13**

18
19 The ecological PRE presented in the SI Report for SA 13 (ABB-ES, 1995d) evaluated
20 potential ecological risks associated with exposure to site contaminants in surface soil,
21 surface water, and sediment.

22
23 **Surface Soil.** A screening-level evaluation of potential effects from surface soil exposure
24 was conducted by comparing the maximum concentrations of all CPCs to their respective
25 surface soil benchmark values. No organic analytes at SA 13 were found to exceed their
26 ecological benchmark values; however, the maximum concentrations of arsenic, barium,
27 beryllium, cadmium, lead, and selenium were greater than their respective surface soil
28 benchmarks. The maximum concentrations of arsenic, barium, beryllium, cadmium, and
29 selenium were only slightly higher than their respective benchmark values and therefore
30 were not considered a significant ecological risk.

31
32 The maximum lead concentration was approximately 6.5 times greater than the benchmark
33 for lead in surface soils, and the average lead concentration was approximately twice the
34 benchmark value. These concentration of lead may pose a risk to certain ecological
35 receptors.

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1
2 **Surface Water.** Risks to aquatic receptors in surface water were evaluated through
3 comparison of maximum concentrations to USEPA chronic AWQC. The maximum
4 concentration of aluminum exceeded the acute and chronic AWQC, while iron and lead
5 exceeded only the chronic AWQC. Because these compounds were present at high levels
6 in background soils and groundwater at Devens, their presence in SA 13 surface water
7 may be reflective of background conditions, and not of landfill impacts. Furthermore, a
8 review of AWQC documents indicated that the ecological receptors upon which the
9 guidance levels are based were among the most sensitive. It is unlikely that the levels of
10 aluminum, iron, and lead in surface water will have an adverse effect on the site's
11 ecological receptors, which are likely to be more tolerant than the risk targeted receptor.
12

13 Mercury was detected in one of the three surface water samples in addition to the
14 duplicate sample. The maximum concentration was less than the acute AWQC, but
15 approximately an order of magnitude greater than the chronic AWQC. The presence of
16 mercury in SA 13 surface water may pose a threat to ecological receptors.
17

18 **Sediment.** Risks to ecological receptors from sediments were evaluated through
19 comparison of maximum concentrations to sediment benchmark values. Maximum lead,
20 copper, arsenic, DDE, gamma-chlordane, and heptachlor concentrations exceeded the
21 screening level benchmark toxicity values. The average lead concentration was lower than
22 the NYSDEC sediment quality guideline and the ER-L of NOAA. The average
23 concentrations of arsenic and copper were only slightly greater than the NYSDEC
24 sediment quality guidelines, and were considerably less than their respective NOAA ER-L.
25 Therefore, lead, copper, and arsenic were not considered to be causing significant
26 ecological risk in SA 13 sediments.
27

28 The maximum DDE concentration is approximately twice the TOC-normalized USEPA
29 Sediment Quality Criteria (SQC) (USEPA, 1989) and approximately an order of
30 magnitude greater than the NOAA ER-L (Long and Morgan, 1990). Heptachlor and
31 gamma-chlordane are also present at concentrations at least an order of magnitude greater
32 than their respective sediment benchmark values. These compounds may be causing
33 significant risks to ecological receptors.

3.2.6 Area of Contamination 40

A supplemental ecological risk assessment was performed at the Cold Spring Brook Landfill and presented in the Final RI Addendum Report (ABB-ES, 1993c) to integrate information gathered from several phases of investigation at the Group 1A sites and determine whether environmental contaminants may pose a risk to ecological receptors. Specifically, the supplemental risk assessment evaluated sediment and fish tissue analytical data that were unavailable when the RI Report was produced. The risk assessment of the RI Report indicated that sediment contamination in Cold Spring Brook Pond may pose a risk to ecological receptors (E&E, 1993). Arsenic was found to be the primary risk contributor to aquatic and semi-aquatic biota. Risks to aquatic biota were also predicted from DDD.

Fish Sampling Program. Average and maximum fish tissue analyte concentrations of fish collected from Cold Spring Brook Pond were compared to regional and national data bases by trophic level. The average fish tissue concentration from Cold Spring Brook Pond exceeded regional averages for the following analytes; DDE, iron, manganese, and zinc. The maximum Cold Spring Brook Pond whole body chain pickerel concentrations of mercury and zinc exceeded their respective National Contaminant Biomonitoring Program 85th percentile concentrations. Fish body weight (and concomitantly trophic status) appears to be a good predictor of mercury contaminant burden in Cold Spring Brook Pond, with higher trophic level fish species having accumulated higher concentrations of this analyte.

A total of 95 fish representing five families and six species were collected in Cold Spring Brook Pond. A gross pathological examination of the fish suggested that the individuals from the population examined were healthy. No tumors, lesions, or other significant abnormalities were observed in any fish examined.

Macroinvertebrates. The macroinvertebrate program at Cold Spring Brook Pond was designed to provide baseline information regarding the biota associated with aquatic habitats in the vicinity of the landfill. The macroinvertebrate community data suggested that Cold Spring Brook Pond may be unimpacted or slightly impacted. Within Cold Spring Brook Pond, sampling stations located adjacent to the landfill appeared to have

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1 lower diversity and abundance of aquatic macroinvertebrates than the station located
2 furthest from the landfill. However, water quality parameters did not appear to be
3 influencing factors in the differences observed. A statistical analysis, although generally
4 inconclusive, did suggest that a group of approximately 15 inorganic CPCs may
5 collectively impact the macroinvertebrate community adversely.

6
7 **Surface Soils.** Based on a review of field sampling data collected during the RI, risks to
8 upland terrestrial wildlife from surface soils were not calculated. The review indicated a
9 lack of significant soil contamination.

10
11 **Surface Water.** The average Cold Spring Brook Pond surface water concentrations of
12 iron and manganese slightly exceeded their respective chronic AWQC values. Under the
13 reasonable maximum exposure (RME) scenario, the maximum concentrations of copper
14 and zinc exceeded their respective acute AWQC values. For both the average exposure
15 and RME scenarios at Cold Spring Brook Pond, no HQs were greater than 1 for any of
16 the eight evaluated semi-aquatic receptor species.

17
18 In the absence of site-specific information regarding bioavailability and toxicity, literature
19 sources were used to establish a range of candidate arsenic and lead preliminary
20 remediation goals (PRGs) for this site. PRG determination for arsenic and lead in
21 sediment was documented in the AOC 40 Final Feasibility Study Report (ABB-ES,
22 1994b). The AOC 40 FS Report recommended sediment removal at two hot spots
23 (Areas I and II) at Cold Spring Brook Pond (see Figure 2-15). Sediment removal at
24 Areas I and II are included as a component of the remedial alternatives evaluated in
25 Section 8.0 of this report.

26
27 **Sediment.** Concentrations of DDD, DDE, DDT, anthracene, arsenic, barium, iron, lead,
28 manganese, mercury, nickel, silver, and zinc exceeded the available sediment quality
29 criteria and guidelines. Because the USEPA sediment quality criteria for DDD, DDE, and
30 DDT may be overly conservative for use at this site, this value was adjusted to reflect
31 more realistic site-specific values. Use of the adjusted pesticide sediment quality criteria
32 HQ eliminates the risk from DDE for the average exposure scenario and lowers risks from
33 DDD for RME scenarios.

3.2.7 Area of Contamination 41

The ecological PRE presented in the Revised Final SI Report for AOC 41 (ABB-ES, 1995d) evaluated potential ecological risks associated with exposure to site contaminants in surface soil, surface water, and sediment.

Surface Soil. The Final SI PRE reported that no organic compounds in surface soil exceeded established benchmark values; however, the maximum detected concentrations of the inorganics antimony, barium beryllium, cadmium, copper, lead, and zinc did exceed their respective benchmark values. These maximum concentrations were associated primarily with samples collected from the landfill surface.

Subsequent to the Final SI, three surface soil samples were collected downgradient of the landfill. With the exception of cobalt, for which no background data are available, the maximum concentrations of all inorganics were less than background concentrations. In addition to inorganics, 16 organic compounds, including 13 PAHs and a PCB, were detected in additional soil samples. A screening-level evaluation of potential effects from surface soil exposure was conducted in which no surface soil benchmark values were exceeded by the maximum detected concentrations of contaminants.

Although several analytes associated with surface soil samples collected during the SI exceeded ecological benchmark values, ecological risks are likely to be minimal. Elevated analyte concentrations were generally associated with samples taken directly from the landfill, and contaminated surface soils do not appear to pose a risk to ecological receptors elsewhere at AOC 41.

Surface Water. The results from two surface water samples collected during the Supplemental SI were combined with surface water sample data from the Final SI. Two organic compounds, DCA and toluene, were detected but are thought to be common laboratory contaminants and not site related. The maximum concentrations of aluminum, copper, iron, lead, and zinc exceeded their benchmark values. Concentrations ranged from two to 93 times the benchmark values.

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1 Although the inorganic analytes exceeded surface water screening values, the maximum
2 concentrations of these compounds were all detected in one sample. Additionally, copper
3 and zinc were undetected in all other surface water samples. It is believed that aluminum
4 and iron were present at naturally high levels in background soils and groundwater at
5 Devens, and the presence of these analytes may be reflective of background conditions,
6 rather than landfill impacts. Furthermore, AWQC documents indicate that standards are
7 based on ecological receptors that are more sensitive than those likely to occur in AOC 41
8 wetlands. Lastly, it is likely that the use of unfiltered surface water samples lead to
9 unrepresentatively high levels of inorganics due to contamination entrained on suspended
10 solids. It is highly unlikely that the elevated levels of contaminants detected will have an
11 adverse effect on potential ecological receptors.

12
13 **Sediment.** During the Supplemental SI, two sediment samples were collected at AOC 41
14 and the data combined with sediment sample data from the Final SI. Seven organic
15 compounds and 11 inorganic analytes were detected in sediment samples.

16
17 The maximum concentrations of DDD, DDE, heptachlor, arsenic, lead, and zinc were the
18 only values identified above their respective benchmark values. Arsenic was detected in
19 all samples at a maximum concentration over twice its benchmark value. Lead was
20 detected in both samples at a maximum concentration approximately 1.5 times its
21 benchmark value. The maximum concentrations of zinc and heptachlor slightly exceeded
22 their benchmarks.

23
24 The maximum concentration of all the compounds were detected in one sediment sample.
25 The average concentrations of all three inorganic analytes were at or near the benchmark
26 values, indicating that it is highly unlikely that arsenic, lead, and zinc pose an ecological
27 risk to aquatic receptors. Additionally, the Interim SQC for DDT and its breakdown
28 products likely represents an extremely conservative guideline for use at Devens.
29 Therefore, it is unlikely that these pesticides in New Cranberry Pond sediments pose a risk
30 to ecological receptors.

4.0 ASSESSMENT OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Compliance with ARARs is one of the CERCLA criteria to be evaluated for each of the alternatives screened for detailed analysis in Section 8. CERCLA was passed by Congress and signed into law on December 11, 1980 (Public Law 96-510). This act was intended to provide for "liability, compensation, cleanup, and emergency response for hazardous substances released into the environment and cleanup of inactive waste disposal sites." SARA, adopted on October 17, 1986 (Public Law 99-499), did not substantially alter the original structure of CERCLA, but provided extensive amendments to it.

In particular, §121 of CERCLA specifies that remedial actions for cleanup of hazardous substances must comply with requirements or standards under federal or more stringent state environmental laws that are applicable or relevant and appropriate to the hazardous substances or circumstances at a site. Inherent in the interpretation of ARARs is the assumption that protection of human health and the environment is ensured.

4.1 TERMS AND DEFINITIONS

The following is an explanation of the terms used throughout this ARARs discussion:

Applicable requirements are "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site" (52 FR 32496, August 27, 1987).

Relevant and appropriate requirements are "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to

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1 those encountered at the CERCLA site that their use is well suited to the particular site"
2 (52 FR 32496).

3
4 Requirements under federal or state law may be either applicable or relevant and
5 appropriate to CERCLA cleanup actions, but not both. However, requirements must be
6 both relevant and appropriate for compliance to be necessary. In the case where both a
7 federal and a state ARAR are available, or where two potential ARARs address the same
8 issue, the more stringent regulation must be selected. The final NCP states that a standard
9 must be legally enforceable and more stringent than a corresponding federal standard to be
10 relevant and appropriate (55 FR 8756, March 8, 1990). However, CERCLA §121(d)(4)
11 provides several ARAR waiver options that may be invoked, providing that the basic
12 premise of protection of human health and the environment is not ignored. A waiver is
13 available for state standards that have not been uniformly applied in similar circumstances
14 across the state. In addition, CERCLA §121(d)(2)(C) forbids state standards that
15 effectively prohibit land disposal of hazardous substances.

16
17 CERCLA on-site remedial response actions must comply only with the substantive
18 requirements of a regulation and not the administrative requirements to obtain federal,
19 state, or local permits [CERCLA §121(e)]. As noted in the ARARs guidance (USEPA,
20 1988):

21
22 The CERCLA program has its own set of administrative procedures which assure
23 proper implementation of CERCLA. The application of additional or conflicting
24 administrative requirements could result in delay or confusion.

25
26 **Substantive requirements** pertain directly to the actions or conditions at a site, while
27 **administrative requirements** facilitate their implementation. In order to ensure that
28 CERCLA response actions proceed as rapidly as possible, the USEPA has reaffirmed this
29 position in the final NCP (55 FR 8756, March 8, 1990). The NCP defines on-site as "the
30 areal extent of contamination and all areas in very close proximity to the contamination
31 necessary for implementation of the response action." The Interagency Agreement (IAG)
32 provides additional guidance on the applicability of permitting requirements to response

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actions at the RFTA (USEPA, 1991b). The USEPA recognizes that certain of the administrative requirements, such as consultation with state agencies and reporting, are accomplished through the state involvement and public participation requirements of the NCP.

The provisions of the MCP, (310 Code of Massachusetts Regulations [CMR] 40.0000) (November 19, 1993) are mostly administrative in nature and, therefore, do not have to be complied with in connection with the response action selected for the Consolidation Landfill. Further, the MCP contains a specific provision (310 CMR 40.0111) for deferring application of the MCP at CERCLA sites. 310 CMR 40.0111(1)(a) provides that response actions at CERCLA sites shall be deemed adequately regulated for purposes of compliance with the MCP, provided the MADEP concurs in the CERCLA ROD.

In the absence of federal- or state-promulgated regulations, many criteria, advisories, guidance values, and proposed standards are not legally binding, but may serve as useful guidance for remedial actions. These are not potential ARARs, but are "to-be-considered" (TBC) guidance. These guidelines may be addressed as deemed appropriate.

ARARs are divided into the three categories listed below.

- **Location-specific ARARs** "set restrictions upon the concentration of hazardous substances or the conduct of activities solely because they are in special locations" (53 FR 51394). In determining the use of location-specific ARARs for selected remedial actions at CERCLA sites, one must investigate the jurisdictional prerequisites of each of the regulations. Basic definitions and exemptions must be analyzed on a site-specific basis to confirm the correct application of the requirements.
- **Chemical-specific ARARs** are usually health- or risk-based standards that limit the concentration of a chemical found in or discharged to the environment. They govern the extent of site remediation by providing either actual cleanup levels, or the basis for calculating such levels. For example, groundwater MCLs may provide the necessary cleanup goals for sites with contaminated groundwater. There are no direct chemical-specific ARARs for soils. Chemical-specific ARARs for the site may also be used to indicate

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1 acceptable levels of discharge in determining treatment and disposal
2 requirements, and to assess the effectiveness of future remedial alternatives.
3

- 4 • **Action-specific ARARs** set controls or restrictions on particular kinds of
5 activities related to the management of hazardous waste (53 FR 51437).
6 Selection of a particular remedial action at a site will invoke the appropriate
7 action-specific ARARs that may specify particular performance standards or
8 technologies, as well as specific environmental levels for discharged or residual
9 chemicals. Action-specific ARARs are established under RCRA, the Clean Air
10 Act, the Clean Water Act, the Safe Drinking Water Act, the Toxic Substances
11 Control Act, and other laws.
12

13 Many regulations can fall into more than one category. For example, many location-
14 specific ARARs are also action-specific because they are triggered if remedial activities
15 affect site features. Likewise, many chemical-specific ARARs are also location-specific.
16

17 The Occupational Safety and Health Administration (OSHA) has promulgated standards
18 for protection of workers at hazardous waste operations at RCRA or CERCLA sites (29
19 CFR Part 1910). These regulations are designed to protect workers who would not be
20 exposed to hazardous waste. Federal construction activities involving no potential for
21 hazardous substance exposure are covered by the OSHA standards found in 29 CFR
22 Part 1926. USEPA requires compliance with the OSHA standards in the NCP (40 CFR
23 300.150), not through the ARAR process. Therefore, the OSHA standards are not
24 considered as ARARs. They are discussed in the site-specific Health and Safety Plan.
25

26 Section 8 contains alternative-specific discussions of ARARs.
27

28 The following subsections present general discussions of location-, chemical-, and action-
29 specific ARARs as they pertain to the remedial alternatives being considered for the
30 landfills at Devens.
31
32

4.2 LOCATION-SPECIFIC ARARs

Federal and Massachusetts location-specific ARARs identified for landfill remediation are discussed in the following paragraphs. These location-specific ARARs are primarily related to the location of the various debris areas in or near wetlands or floodplains, critical habitats, or areas of potential historical or archeological significance. Table 4-1 presents location-specific ARARs.

Federal ARARs. The Floodplain Management Executive Order No. 11988 (40 CFR Part 6, App. A) is applicable to activities involved in the debris excavation portion of the Consolidation Landfill project. This executive order protects floodplains from adverse effects of direct and indirect development, and provides that potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain. Three of the debris areas are located within floodplains: AOCs 9, 11, and 40. AOC 11 is located within the 100-year floodplain of the Nashua River and is separated from the river by a 40-ft-wide berm; and Cold Spring Brook Pond may be impacted by remedial actions at the Cold Spring Brook Landfill, which could involve removal of debris and contaminated sediment from within the pond.

The Protection of Wetlands Executive Order No. 11990 (40 CFR Part 6, Appendix. A) is applicable to activities related to remedial actions at the landfills. This executive order protects wetlands from destruction, loss, and degradation, and attempts to preserve and enhance the natural and beneficial values of wetlands. Most of the seven debris areas are located within or adjacent to wetlands.

The Clean Water Act, Dredge or Fill Requirements, Section 404 (33 CFR Part 230; 40 CFR Part 230) is applicable to activities related to remedial actions at the landfills. Section 404 regulates the discharge of dredged or fill material to waters of the United States, including wetlands. If adverse conditions resulting from dredging and filling operations are unavoidable, action must be taken to restore or create alternative wetlands.

The Rivers and Harbors Act of 1899 (33 U.S. Code 401 et seq.) is applicable to activities involved in the excavation of debris for consolidation in the Consolidation Landfill. The act regulates the construction of any structure in or over any "navigable water of the United States," the excavation from or deposition of material in such waters, or any

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1 obstruction or alteration in such waters. Because waste material excavation from within
2 Cold Stream Brook Pond and sediment dredging from the Nashua River are being
3 evaluated, this ARAR would need to be attained.

4
5 The Archeological and Historic Preservation Act (16 U.S. Code 469; 40 CFR
6 Part 6301(c)) is applicable to activities related to remedial actions at the landfills. This act
7 establishes procedures to provide for preservation of historical and archeological
8 resources that might be destroyed through alteration of terrain as a result of a federal
9 construction project. SA 6 has been investigated by archaeologists and was determined to
10 be a potentially valuable archeological resource, and is recommended for further
11 investigation prior to any remedial or removal actions. The requirements of this act will
12 be met to ensure that the archeological data at SA 6 are properly protected.

13
14 The Fish and Wildlife Coordination Act (16 USC 661 et seq.; 40 CFR Part 302) is
15 applicable to activities related to remedial actions at the landfills. Actions that affect
16 species/habitats require consultation with Department of the Interior, U.S. Fish and
17 Wildlife Service, National Marine Fisheries Service, and other agencies as appropriate to
18 ensure that proposed actions do not jeopardize the continued existence of the species or
19 adversely modify or destroy critical habitat, and actions must be taken to prevent,
20 mitigate, or compensate for project-related damages or losses to fish and wildlife
21 resources.

22
23 The Endangered Species Act (16 USC 1531 et seq.; 50 CFR Part 402) is relevant and
24 appropriate to activities related to remedial actions at the landfills. This act requires action
25 to avoid jeopardizing the continued existence of the listed endangered or threatened
26 species or modification of their habitat. While no federally protected species are recorded
27 at any of the debris areas or at the proposed location of the Consolidation Landfill, the
28 substantive requirements of the act will be taken into account.

29
30 **Massachusetts ARARs.** The Massachusetts Wetlands Protection Act and regulations
31 (MGL c. 131, s. 40; 310 CMR 10.00) are applicable to activities related to remedial
32 actions at the landfills. These regulations set the performance standards for dredging,

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1 filling, or altering wetlands and lands under water, and work within 100 ft of a wetland is
2 also regulated under these requirements. Because several of the debris areas are in or
3 adjacent to wetlands, or within 100 ft of a wetland, these requirements will be met.

4
5 The Massachusetts Endangered Species Act (MGL c. 131A, s. 1 et seq.; 321 CMR 8.00)
6 is applicable to activities related to remedial actions at the landfills. This act and
7 implementing regulations, in conjunction with the Massachusetts Natural Heritage
8 Program (MNHP) species list, identifies critical species that may be found during the
9 course of site cleanup. Several Massachusetts-listed species have been recorded at the
10 debris areas or near the proposed location of the Consolidation Landfill, including: the
11 Grasshopper Sparrow, a Species of Special Concern, which breeds on Shepley's Hill
12 Landfill; The Upland Sandpiper, a Massachusetts Endangered Species that migrates
13 through the Devens area and has been recorded at Shepley's Hill Landfill; the Coopers
14 Hawk, a Species of Special Concern with flyby records at Shepley's Hill Landfill; and the
15 Blandings Turtle, a Massachusetts Threatened Species that has been recorded as breeding
16 at SA 12. Prior to construction activities at any of these locations, the MNHP will be
17 contacted.

18
19 The Massachusetts Waterways Act (MGL c. 91; 310 CMR 9.00) is relevant and
20 appropriate to the activities being evaluated for landfill remediation. The act and
21 regulations set forth licensing requirements for any work in or over any tidelands, river or
22 stream, great pond, or outlet thereof. While no licenses are required for on-site activities
23 at CERCLA sites, the substantive requirements of the act will be met.

24 25 26 **4.3 CHEMICAL-SPECIFIC ARARS**

27
28 Federal and Massachusetts chemical-specific ARARs are discussed in the following
29 paragraphs. These chemical-specific ARARs are primarily related to the remedial actions
30 proposed for the Cold Spring Brook Landfill, and are discussed in more detail in the Cold
31 Spring Brook Landfill Operable Unit FS (ABB-ES, 1994b). Table 4-2 presents chemical-
32 specific ARARs.

33
34 **Federal ARARs.** The Clean Water Act AWQC (40 CFR Part 131; Water Quality
35 Criteria) are applicable to activities which could cause contamination of surface water.

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1 Federal AWQC for protection of human health provide protective concentrations for
2 exposure from ingesting contaminated water and contaminated aquatic organisms, and
3 from ingesting contaminated aquatic organisms alone. Federal AWQC also include acute
4 and chronic toxicity values for the protection of aquatic life. Remedial actions involving
5 contaminated surface water or discharge of contaminants to surface water must consider
6 the uses of the water and the circumstances of the potential release. Sediment removal
7 and wetland excavation could potentially result in AWQC exceedances.

8
9 The Safe Drinking Water Act, National Primary Drinking Water Standards, MCLs (40
10 CFR Parts 141.11 - 141.16 and 141.50 - 141.53) are applicable to activities related to
11 remedial actions at the Devens landfills. MCLs specify the maximum permissible
12 concentrations of contaminants in public drinking water supplies.

13
14 **Massachusetts ARARs.** The Massachusetts Surface Water Quality Standards (314 CMR
15 4.00) are applicable to activities related to remedial actions at the landfills. These
16 standards designate the most sensitive uses for which surface waters of the
17 Commonwealth are to be enhanced, maintained, and protected, and to designate minimum
18 water quality criteria for sustaining the designated uses. Surface waters at the landfill
19 areas are classified as Class B, and are designated as habitat for fish, other aquatic life, and
20 wildlife, and for primary and secondary recreation. Sediment removal and wetland
21 excavation could potentially result in Surface Water Quality standard exceedances.

22
23 The Massachusetts Groundwater Quality Standards (314 CMR 6.00) are relevant and
24 appropriate to activities related to remedial actions at the Devens landfills. These
25 standards designate and assign uses for which groundwaters of the Commonwealth shall
26 be maintained and protected, and set forth water quality criteria necessary to maintain the
27 designated uses. Groundwater at Fort Devens is classified as Class I, fresh groundwaters
28 designated as a source of potable water supply.

29
30 The Massachusetts Drinking Water Standards and Guidelines (314 CMR 22.00) are
31 relevant and appropriate to activities related to remedial actions at the Devens landfills.

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These standards and guidelines list Massachusetts MCLs which apply to water delivered to any user of a public water supply system.

4.4 ACTION-SPECIFIC ARARs

Federal and Massachusetts action-specific ARARs are discussed in the following paragraphs. Table 4-3 presents action-specific ARARs.

Federal ARARs. The Clean Water Act National Pollutant Discharge Elimination System (NPDES) Permit Program (40 CFR Parts 122 and 125) is applicable. The NPDES permit program specifies the permissible concentration or level of contaminants in the discharge from any point source to waters of the United States.

Massachusetts ARARs. The Massachusetts Solid Waste Facilities Site Regulations (310 CMR 16.00) are applicable to the siting of a landfill or solid waste facility. These regulations list the criteria MADEP uses in approving or rejecting a site for a solid waste landfill. These regulations are more stringent than 40 CFR Part 257, and thus take precedence.

The Massachusetts Solid Waste Management Regulations (310 CMR 19.000) are applicable to the construction/operation of a landfill or solid waste facility. These regulations outline the requirements for construction, operation, closure, and post-closure at solid waste management facilities in the Commonwealth. These regulations are more stringent than 40 CFR Part 257, and thus take precedence.

The Massachusetts Water Quality Certification and Certification of Dredging requirements (314 CMR 9.00) are relevant and appropriate to the activities being evaluated for landfill remediation. A Water Quality Certification is required for activities that require a MADEP Wetlands Order of Conditions to dredge or fill navigable waters or wetlands, a USACE permit, or any major permit issued by the USEPA. While no licenses are required for on-site activities at CERCLA sites, the substantive requirements will be met.

5.0 BASIS FOR REMEDIATION

Response objectives, identified in this section, form the basis for identifying remedial technologies and developing remedial alternatives. Response objectives are site-specific, qualitative objectives based on the nature and extent of waste, the resources currently or potentially affected, and the potential for human and environmental exposure.

For Devens landfill remediation, response objectives were formulated based on environmental concerns defined in the pertinent environmental contamination assessments, risk assessments, and ARARs analyses presented in the SI and RI reports prepared for the seven Devens landfills. Response objectives were used to develop appropriate remedial alternatives.

The following response objectives were identified for landfill remediation:

- Prevent human exposure to groundwater contaminants released from Devens landfills that exceed acceptable risk thresholds.
- Protect human and ecological receptors from exposure to landfill soils having concentrations of contaminants exceeding acceptable risk thresholds.
- Prevent landfill contaminant releases to surface water that result in exceedance of AWQC or acceptable ecological risk-based thresholds.
- Prevent exposure by ecological receptors to landfill-contaminated sediments exceeding acceptable risk-based thresholds.
- Reduce adverse impacts from contaminated landfill media to the environment that would reduce the amount of land area available for natural resources use.

6.0 TECHNOLOGY IDENTIFICATION AND SCREENING

Remedial technologies considered implementable, and which address the response objectives listed in Section 5, are identified in this section. Candidate remedial technologies are then screened based on their applicability to landfill remediation. The purpose of the screening is to produce an inventory of suitable technologies that can be assembled into remedial alternatives capable of meeting response objectives.

6.1 TECHNOLOGY IDENTIFICATION

Categories of remedial technologies and specific process options were identified based on a review of literature, vendor information, and experience in developing other FSs under CERCLA. Table 6-1 identifies remedial technologies and debris process options to be considered for inclusion in remedial alternatives. Table 6-2 provides descriptions for debris process options.

6.2 TECHNOLOGY SCREENING

The technology screening process reduces the number of potentially applicable technologies and process options by evaluating factors that may influence process option effectiveness and implementability. This overall screening is consistent with the guidance for conducting FSs under CERCLA (USEPA, 1988).

The screening process assesses each technology or process option for its probable effectiveness and implementability with regard to site-specific conditions, and physical debris characteristics. The effectiveness evaluation focuses on: (1) whether the technology is capable of handling the estimated debris volume and of meeting the goals identified in the response objectives; (2) the effectiveness of the technology in protecting human health during the construction and implementation phase; and (3) the reliability of the technology with respect to debris characteristics and conditions at the various sites where the work will take place. Implementability encompasses both the technical and

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1 institutional feasibility of implementing a technology. Effectiveness and implementability
2 are incorporated into two screening criteria: waste- and site-limiting characteristics.

3
4 Waste-limiting characteristics largely establish the effectiveness and performance of a
5 technology; site-limiting characteristics affect implementability of a technology.

6 Waste-limiting characteristics consider the suitability of a technology based on debris
7 types. Site-limiting characteristics consider the effect of site-specific physical features,
8 including topography and available space. Technology screening based on waste- and
9 site-limiting characteristics serves the two-fold purpose of screening out technologies
10 whose applicability is limited by debris characteristics or site considerations, while
11 retaining as many potentially applicable technologies as possible.

12
13 Table 6-3 summarizes the technology screening phase. Technologies and process options
14 judged effective or implementable were retained for further consideration.

15
16 Table 6-4 summarizes the technologies retained for further consideration. The
17 technologies retained following screening represent an inventory of technologies
18 considered most suitable for landfill remediation. Technologies retained in this section
19 may be used to develop remedial alternatives.
20

7.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

In this section, technically feasible technologies and process options retained following the screening described in Section 6 are combined to form remedial alternatives. Alternatives are developed to attain the remedial action objectives discussed in Section 5.

Six candidate alternatives for landfill remediation were developed by the Devens BRAC Cleanup Team (BCT) on March 31, 1995. These are documented in the BCT Plan of Action (Appendix A). The six alternatives included various combinations of capping landfills in-place, excavating landfill wastes, disposing of excavated debris in a new on-site landfill (excavation/consolidation), and disposing landfill wastes offsite. The waste consolidation alternatives were evaluated in the Draft Consolidation Landfill Feasibility Study report (ABB-ES, 1995c). The FS report evaluated only alternatives involving waste consolidation, and did not assess alternatives involving capping wastes in-place. The FS report was reviewed by MADEP, USEPA, U.S. Department of the Interior (Fish and Wildlife Service), and FORSCOM. Review comments by FORSCOM indicated a preference to evaluate cap-in-place alternatives as well as consolidation alternatives.

To respond to the FORSCOM comments, a Technical Memorandum (ABB-ES, 1996b) was prepared. The Technical Memorandum compared the costs of capping the seven landfills in-place with costs of consolidating landfilled waste. The memorandum documented that costs to cap landfills in-place are necessarily less, because additional site investigations, remedial alternative evaluations, and post-closure monitoring plans would also be required.

On December 9, 1996, the BCT developed nine alternatives for remediation of the landfills. As with the six alternatives developed in the Plan of Action, these nine alternatives were comprised of various capping and waste consolidation combinations at the seven disposal areas. Although similar to the six earlier alternatives, only one of the nine alternatives was identical. Thus, a total of fourteen alternatives were developed by the BCT. These are listed in Table 7-1. Alternative PA-2 is identical to Alternative 9, and will be eliminated from further discussion in this report.

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1 The remedial alternatives were then screened with respect to the criteria of effectiveness,
2 implementability, and cost to meet the requirements of CERCLA and the NCP. The
3 screening step was designed to eliminate impractical and higher cost alternatives (i.e.,
4 order of magnitude cost differences) that provide little or no greater in effectiveness or
5 implementability over lower cost alternatives. Alternative 1 - No Further Action (NFA)
6 under CERCLA will not be evaluated according to these screening criteria; this alternative
7 will be screened as a baseline for the other retained alternatives (USEPA, 1988) during the
8 detailed analysis. The three criteria used for screening the alternatives follow:

9
10 **Effectiveness.** Each alternative was judged for its ability to effectively protect public
11 health and the environment by reducing the toxicity, mobility, or volume of contaminants.
12 Both short- and long-term effectiveness were screened. Short-term effectiveness included
13 reducing existing risks to the community and workers during the construction and
14 implementation period, ability to meet remedial action objectives, and time frame required
15 to achieve remedial action objectives. Long-term effectiveness, which applies after
16 remedial action objectives have been attained, considered the magnitude of the remaining
17 residual risk due to untreated wastes and waste residuals, and the adequacy and reliability
18 of specific technical components and control measures. Effectiveness also considered
19 adverse environmental impacts during construction and implementation of the alternative,
20 and the availability of mitigating measures to minimize impacts.

21
22 **Implementability.** Each alternative was evaluated in terms of technical and
23 administrative feasibility. In the assessment of short-term technical feasibility, availability
24 of a technology for construction or mobilization and operation, as well as compliance with
25 action-specific ARARs during the remedial action were considered. Long-term technical
26 feasibility considered the ease of operation and maintenance (O&M), replacement,
27 monitoring of technical controls of residuals and untreated wastes, technology reliability,
28 and ease of undertaking additional remedial actions. Administrative feasibility for
29 implementing a given technology addressed coordination with other agencies.
30 Implementability also considers the availability of required services and trained specialists
31 or operators.
32

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Cost. The final criterion for screening of alternatives was the associated cost including relative capital and O&M costs, as well as factors influencing cost sensitivity. Absolute accuracy of cost estimates during screening was not considered essential. The focus was rather to make relatively accurate comparative estimates for alternatives so that cost decisions would be sustained as the accuracy of cost estimates improves beyond screening (USEPA, 1988). Detailed cost estimates for those alternatives not eliminated after screening are presented in the detailed analysis of retained alternatives in Section 8.

Alternative Evaluation. For each alternative, a matrix was developed highlighting the alternative's advantages and disadvantages with respect to effectiveness, implementability, and cost. The alternative evaluation matrix presented a concise procedure for screening potential remedial action alternatives. Based on this matrix, a decision was made to either retain the alternative for detailed analysis or eliminate it from further consideration.

7.1 DEVELOPMENT OF ALTERNATIVES FOR LANDFILL REMEDIATION

Fourteen remedial alternatives were developed by the BCT to address remedial response objectives presented in Section 5. In assembling the alternatives, general response actions and technology process options selected to represent the various technology types were combined to form alternatives (USEPA, 1988). Alternatives were developed to provide a range of options consistent with USEPA RI/FS guidance (USEPA, 1988).

7.1.1 Alternative PA-1: Cap-in-Place AOCs 9, 11, 40, 41, and Excavate/Dispose Off-Site SAs 6, 12, 13

Alternative PA-1 consists of placing a low-permeability cap on landfills at AOCs 9, 11, 40, 41, excavating wastes at SAs 6, 12, 13, and disposing them off site.

The cap designs would include a hydraulic barrier layer to prevent infiltration of precipitation. A 30-year groundwater monitoring program would be performed at the capped landfills. Landfills where waste excavation occurs would be backfilled with soil and vegetated.

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7.1.2 Alternative PA-2: Excavate/Consolidate AOCs 9, 11, 40, 41, and SAs 6, 12 and 13 near Shepley's Hill

Alternative PA-2 is identical to Alternative 9. See Subsection 7.1.15 for Alternative 9 description.

7.1.3 Alternative PA-3: Excavate/Consolidate AOCs 9, 40, 41, and SAs 6, 12, and 13 at the North Post Landfill, and Cap-in-Place AOC 11

Alternative PA-3 consists of excavating wastes at AOCs 9, 40, 41, and SAs 6, 12, 13, and disposing of them in a consolidation landfill to be constructed at AOC 9 (North Post Landfill). The consolidation landfill would contain a leachate collection system and be covered with a low-permeability cap.

The landfill at AOC 11 would be covered in-place with a low-permeability cap designed to prevent infiltration of precipitation. A 30-year groundwater monitoring program would be performed at the capped landfills.

7.1.4 Alternative PA-4: Excavate/Consolidate AOCs 9, 11, 40, 41, and SAs 6, 12, 13 at the North Post Landfill

Alternative PA-4 consists of excavating wastes at AOCs 9, 11, 40, and 41 and SAs 6, 12, 13 (all seven landfills) and disposing of them in a consolidation landfill to be constructed at AOC 9 (North Post Landfill). The consolidation landfill would contain a leachate collection system and be covered with a low-permeability cap. A 30-year groundwater monitoring program would be performed at the capped landfill.

7.1.5 Alternative PA-5: Excavate/Consolidate AOCs 40, 41, and SAs 6, 12, and 13 near Shepley's Hill, and Cap-in-Place AOCs 9 and 11

Alternative PA-5 consists of excavating wastes at AOCs 40 and 41 and SAs 6, 12, 13, and disposing of them in a consolidation landfill to be constructed in the expansion area near Shepley's Hill landfill. The consolidation landfill would contain a leachate collection system and be covered with a low-permeability cap.

Landfills at AOCs 9 and 11 would be covered in-place with a low-permeability cap designed to prevent infiltration of precipitation. A 30-year groundwater monitoring program would be performed at the capped landfills.

7.1.6 Alternative PA-6: Excavate/Consolidate AOCs 9, 11, 41 and SAs 6, 12, and 13 near Shepley's Hill, and Cap-in-Place AOC 40

Alternative PA-6 consists of excavating wastes at AOCs 9, 11, 41, and SAs 6, 12, and 13 and disposing of them in a consolidation landfill to be constructed in the expansion area near Shepley's Hill landfill. The consolidation landfill would contain a leachate collection system and be covered with a low-permeability cap.

The landfill at AOC 40 would be covered in-place with a low-permeability cap designed to prevent infiltration of precipitation. A 30-year groundwater monitoring program would be performed at the capped landfills.

7.1.7 Alternative 1: No Further Action

Alternative 1 consists of NFA at all seven landfills. No remedial activities would be undertaken to meet the response objectives described in Section 5 of this report.

7.1.8 Alternative 2: No Further Action at AOC 41, and SAs 6, 12, and 13; Limited Removal at AOC 11 (Disposal at AOC 9), and Cap-in-Place at AOCs 9 and 40

Alternative 2 consists of NFA at AOC 41 and SAs 6, 12, 13. At AOC 11, surface debris only would be removed and disposed under an in-place cap at AOC 9. At AOCs 9 and

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40, a low-permeability cap designed to prevent infiltration of precipitation would be constructed. A 30-year groundwater monitoring program would be performed at the two capped landfills.

7.1.9 Alternative 3: No Further Action at AOC 41 and SAs 6, 12, and 13; and Cap-in-Place at AOCs 9, 11, and 40

Alternative 3 consists of placing a low-permeability cap designed to prevent infiltration of precipitation over landfills at AOCs 9, 11, 40. A 30-year groundwater monitoring program would be performed at the three capped landfills. No action would be taken at AOC 41 and SAs 6, 12, 13.

7.1.10 Alternative 4: No Further Action at AOC 41 and SAs 6, 12, and 13; Limited Removal at AOC 11 (Disposal in Consolidation Landfill); and Excavation and Consolidation AOCs 9 and 40

Alternative 4 consists of excavating wastes at AOCs 9 and 40, and disposing of them in a consolidation landfill to be constructed in the expansion area near Shepley's Hill landfill. The consolidation landfill would contain a leachate collection system and be covered with a low-permeability cap. At AOC 11, surface debris only would be removed and disposed in the consolidation landfill. NFA would be taken at AOC 41 and SAs 6, 12, 13.

7.1.11 Alternative 5: Limited Removal at AOC 11 (Disposal in Consolidation Landfill); and Cap-in-Place at AOC 41 and SAs 6, 12, and 13; and Excavation and Consolidation of AOCs 9 and 40

Alternative 5 consists of excavating wastes at AOCs 9 and 40, and disposing of them in a consolidation landfill to be constructed in the expansion area near Shepley's Hill landfill. The consolidation landfill would contain a leachate collection system and be covered with a low-permeability cap. A low-permeability cap designed to prevent infiltration of precipitation would be placed on landfills at AOC 41 and SAs 6, 12, 13. A 30-year

1 groundwater monitoring program would be performed at the capped landfills. At AOC 11
2 surface debris only would be removed and disposed in the consolidation landfill.

3
4 **7.1.12 Alternative 6: Cap-in-Place at AOC 41 and SAs 6, 12, and 13; and**
5 **Excavation and Consolidation of AOCs 9, 11, and 40**
6

7 Alternative 6 consists of excavating wastes at AOCs 9, 11, and 40, and disposing them in
8 a consolidation landfill to be constructed in the expansion area near Shepley's Hill landfill.
9 The consolidation landfill would contain a leachate collection system and be covered with
10 a low-permeability cap. A low-permeability cap designed to prevent infiltration of
11 precipitation would be placed on landfills at AOC 41 and SAs 6, 12, 13. A 30-year
12 groundwater monitoring program would be performed at the capped landfills.
13

14 **7.1.13 Alternative 7: Cap-in-Place at All Seven Disposal Areas**
15

16 Alternative 7 consists of placing a low-permeability cap designed to prevent infiltration of
17 precipitation on all seven landfills. A 30-year groundwater monitoring program would be
18 performed at the capped landfills.
19

20 **7.1.14 Alternative 8: Limited Removal at AOC 11 (Disposal in Consolidation**
21 **Landfill); and Excavation and Consolidation of AOCs 9, 40, and 41, and SAs**
22 **6, 12, and 13**
23

24 Alternative 8 consists of excavating wastes at AOCs 9, 40, 41 and SAs 6, 12, 13, and
25 disposing them in a consolidation landfill to be constructed in the expansion area near
26 Shepley's Hill landfill. The consolidation landfill would contain a leachate collection
27 system and be covered with a low-permeability cap. At AOC 11, surface debris only
28 would be removed and disposed in this consolidation landfill.
29

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7.1.15 Alternative 9: Excavation and Consolidation of All Seven Disposal Areas

Alternative 9 consists of excavating wastes at all seven landfills and disposing them in a consolidation landfill to be constructed in the expansion area near Shepley's Hill landfill. The consolidation landfill would contain a leachate collection system and be covered with a low-permeability cap.

7.2 SCREENING OF ALTERNATIVES FOR THE CONSOLIDATION LANDFILL

Based on the screening approach presented at the beginning of this section, screening matrices for each alternative are presented in Table 7-2 and a screening summary is presented in Table 7-3.

7.2.1 Alternative PA-1: Cap-in-Place AOCs 9, 11, 40, and 41, and Excavate/Dispose Off-Site SAs 6, 12, 13

Effectiveness. The long-term effectiveness of a low-permeability landfill cover at controlling potential future releases from the unsaturated zone beneath would depend on maintenance of cap integrity. If adequately installed and maintained, low-permeability cover systems have a history of effectively reducing surface infiltration to landfill materials, promoting surface water drainage, minimizing erosion, and isolating landfill materials from the environment.

Excavation and offsite disposal of landfill debris would effectively prevent human and ecological exposure and prevent the landfill from being a potential source of future groundwater contamination.

Implementability. Cover system construction can be accomplished using standard construction procedures and conventional earthmoving equipment. Many engineering and construction companies are qualified to design and construct a landfill cover system. Post-closure monitoring and maintenance are easily implementable. Installation of the cover

1 system could increase the scope of potential future remedial actions at the site, if these
2 actions required access to the debris.

3
4 Debris excavation and offsite disposal can be accomplished using standard construction
5 procedures and conventional earthmoving equipment, and many engineering and
6 construction companies are qualified and available.

7
8 **Cost.** The capital costs associated with this alternative are moderate. The associated
9 operating costs are moderate.

10
11 **Conclusion.** This alternative will be eliminated from further evaluation. Offsite disposal
12 costs are too high compared to other available disposal options.

13
14 **7.2.2 Alternative PA-2: Excavate/Consolidate AOCs 9, 11, 40, and 41, and SAs 6,
15 12, 13 near Shepley's Hill**

16
17 Alternative PA-2 is identical to Alternative 9. See Subsection 7.2.15 for Alternative 9
18 screening.

19
20 **7.2.3 Alternative PA-3: Excavate/Consolidate AOCs 9, 40, and 41 and SAs 6, 12,
21 and 13 at North Post Landfill; Cap-in-Place AOC 11**

22
23 **Effectiveness.** The long-term effectiveness of a low-permeability landfill cover at
24 controlling potential future releases from the unsaturated zone beneath AOC 11 would
25 depend on the maintenance of cap integrity. If adequately installed and maintained, low
26 permeability cover systems have a history of effectively reducing surface infiltration to
27 landfill materials, promoting surface water drainage, minimizing erosion, and isolating
28 landfill materials from the environment.

29
30 Excavation of landfill debris would effectively prevent human and ecological exposure and
31 would prevent the landfill from being a potential source of future groundwater
32 contamination. The effectiveness of the consolidation facility at isolating landfill debris
33 would depend on the quality of construction and proper maintenance of cover and
34 leachate collection systems. Landfills that include groundwater protection systems with

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1 leachate collection, cover systems, and long-term monitoring and maintenance have a
2 history of effectively isolating wastes from the environment.

3
4 **Implementability.** Cover system construction can be accomplished using standard
5 construction procedures and conventional earthmoving equipment. Many engineering and
6 construction companies are qualified to design and construct a landfill cover system. Post-
7 closure monitoring and maintenance are easily implementable. Installation of the cover
8 system could increase the scope of potential future remedial actions at the site, if these
9 actions required access to the debris.

10
11 Landfill excavation and construction can be accomplished using standard construction
12 procedures and conventional earthmoving equipment, and many engineering and
13 construction companies are qualified and available. Successful implementation of this
14 alternative is contingent on the approval and construction of a consolidation facility to
15 accept the excavated debris. The consolidation facility would be constructed and
16 maintained to effectively isolate landfill debris. Implementation of this alternative would
17 not limit or interfere with the ability to perform future remedial actions at the excavated
18 landfill.

19
20 **Cost.** The capital costs associated with this alternative are high. The associated operating
21 costs are moderate.

22
23 **Conclusion.** This alternative will be eliminated from further evaluation. Costs associated
24 with excavating and staging wastes at the North Post Landfill prior to constructing the
25 consolidation landfill are too high compared to constructing the landfill near Shepley's
26 Hill.

27 28 **7.2.4 Alternative PA-4: Excavate/Consolidate AOCs 9, 11, 40, and 41 and SAs 6,** 29 **12, and 13 at North Post Landfill**

30
31 **Effectiveness.** Excavation of landfill debris would effectively prevent human and
32 ecological exposure and would prevent the landfill from being a potential source of future

1 groundwater contamination. The effectiveness of the consolidation facility at isolating
2 landfill debris would depend on the quality of construction and proper maintenance of
3 cover and leachate collection systems. Landfills that include groundwater protection
4 systems with leachate collection, cover systems, and long-term monitoring and
5 maintenance have a history of effectively isolating wastes from the environment.

6
7 **Implementability.** Landfill excavation and construction can be accomplished using
8 standard construction procedures and conventional earthmoving equipment, and many
9 engineering and construction companies are qualified and available. Successful
10 implementation of this alternative is contingent on the approval and construction of a
11 consolidation facility to accept the excavated debris. The consolidation facility would be
12 constructed and maintained to effectively isolate landfill debris. Implementation of this
13 alternative would not limit or interfere with the ability to perform future remedial actions
14 at the excavated landfill.

15
16 **Cost.** The capital costs associated with this alternative are high. The associated operating
17 costs are moderate.

18
19 **Conclusion.** This alternative will be eliminated from further evaluation. Costs associated
20 with excavating and staging wastes at the North Post Landfill prior to constructing the
21 consolidation landfill are too high compared to constructing the landfill near Shepley's
22 Hill.

23 24 **7.2.5 Alternative PA-5: Excavate/Consolidate AOCs 40 and 41 and SAs 6, 12, and** 25 **13 near Shepleys Hill, Cap-in-Place AOCs 9 and 11**

26
27 **Effectiveness.** The long-term effectiveness of a low-permeability landfill cover at
28 controlling potential future releases from the unsaturated zone beneath the landfills would
29 depend on the maintenance of cap integrity. If adequately installed and maintained, low-
30 permeability cover systems have a history of effectively reducing surface infiltration to
31 landfill materials, promoting surface water drainage, minimizing erosion, and isolating
32 landfill materials from the environment.

33
34 Excavation of landfill debris would effectively prevent human and ecological exposure and
35 would prevent the landfill from being a potential source of future groundwater

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1 contamination. The effectiveness of the consolidation facility at isolating landfill debris
2 would depend on the quality of construction and proper maintenance of cover and
3 leachate collection systems. Landfills that include groundwater protection systems with
4 leachate collection, cover systems and long-term monitoring and maintenance have a
5 history of effectively isolating wastes from the environment.

6
7 **Implementability.** Cover system construction can be accomplished using standard
8 construction procedures and conventional earthmoving equipment. Many engineering and
9 construction companies are qualified to design and construct a landfill cover system. Post-
10 closure monitoring and maintenance are easily implementable. Installation of the cover
11 system could increase the scope of potential future remedial actions at the site, if these
12 actions required access to the debris.

13
14 Landfill excavation and construction can be accomplished using standard construction
15 procedures and conventional earthmoving equipment, and many engineering and
16 construction companies are qualified and available. Successful implementation of this
17 alternative is contingent on the approval and construction of a consolidation facility to
18 accept the excavated debris. The consolidation facility would be constructed and
19 maintained to effectively isolate landfill debris. Implementation of this alternative would
20 not limit or interfere with the ability to perform future remedial actions at the excavated
21 landfill.

22
23 **Cost.** This capital costs associated with this alternative are high. The associated
24 operating costs are moderate.

25
26 **Conclusion.** Alternative PA-5 will be eliminated from further evaluation. This alternative
27 contains different actions for AOCs 9 and 40, the landfills having the two largest waste
28 volumes. Thus, economics of scale cannot be realized.

29 30 **7.2.6 Alternative PA-6: Excavate/Consolidate AOCs 9, 11, 41 and SAs 6, 12, 13** 31 **near Shepley's Hill, Cap-in-Place AOC 40** 32

1 **Effectiveness.** The long-term effectiveness of a low-permeability landfill cover at
2 controlling potential future releases from the unsaturated zone beneath AOC 40 would
3 depend on the maintenance of cap integrity. When adequately installed and maintained,
4 low permeability cover systems have a history of effectively reducing surface infiltration to
5 landfill materials, promoting surface water drainage, minimizing erosion, and isolating
6 landfill materials from the environment.

7
8 Excavation of landfill debris would effectively prevent human and ecological exposure and
9 would prevent the landfill from being a potential source of future groundwater
10 contamination. The effectiveness of the consolidation facility at isolating landfill debris
11 would depend on the quality of construction and proper maintenance of cover and
12 leachate collection systems. Landfills that include groundwater protection systems with
13 leachate collection, cover systems, and long-term monitoring and maintenance have a
14 history of effectively isolating wastes from the environment.

15
16 **Implementability.** Cover system construction can be accomplished using standard
17 construction procedures and conventional earthmoving equipment. Many engineering and
18 construction companies are qualified to design and construct a landfill cover system. Post-
19 closure monitoring and maintenance are easily implementable. Installation of the cover
20 system could increase the scope of potential future remedial actions at the site, if these
21 actions required access to the debris.

22
23 Landfill excavation and construction can be accomplished using standard construction
24 procedures and conventional earthmoving equipment, and many engineering and
25 construction companies are qualified and available. Successful implementation of this
26 alternative is contingent on the approval and construction of a consolidation facility to
27 accept the excavated debris. The consolidation facility would be constructed and
28 maintained to effectively isolate landfill debris. Implementation of this alternative would
29 not limit or interfere with the ability to perform future remedial actions at the excavated
30 landfill.

31
32 **Cost.** The capital costs associated with this alternative are high. The associated operating
33 costs are moderate.

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1 **Conclusion.** Alternative PA-6 will be eliminated from further evaluation. This alternative
2 contains different actions for AOCs 9 and 40, the landfills having the two largest waste
3 volumes. Thus, economics of scale cannot be realized.

4 5 **7.2.7 Alternative 1: No Further Action**

6
7 This alternative will pass through screening and be evaluated in detail in Section 8.

8 9 **7.2.8 Alternative 2: No Further Action at AOC 41, and SAs 6, 12, and 13; and** 10 **Limited Removal at AOC 11 (Disposal at AOC 9); and Cap-in-Place at** 11 **AOCs 9 and 40**

12
13 **Effectiveness.** At SA 6, potential human health and environmental risks have not been
14 evaluated in a PRE or baseline risk assessment, but are considered minimal. Therefore,
15 this alternative is considered to provide limited protection of human health and the
16 environment at SA 6.

17
18 This alternative does not provide protection of human health and the environment at
19 SAs 12 and 13, and AOC 41.

20
21 At AOC 11, removal and disposal of surface debris would remove potential physical
22 hazards to occasional site visitors and reduce human and terrestrial receptor exposure to
23 surface soil, thereby reducing potential risk. Because potential human health risks were
24 within or below the USEPA target values, the human health risk reduction benefit is
25 considered low. No actions would be included to reduce or monitor potential ecological
26 risk from exposure to wetland soil/sediment or surface water.

27
28 The long-term effectiveness of a low permeability landfill cover at controlling potential
29 future releases from the unsaturated zone beneath the landfill would depend on the
30 maintenance of cap integrity. When adequately installed and maintained, low permeability
31 cover systems have a history of effectively reducing surface infiltration to landfill

1 materials, promoting surface water drainage, minimizing erosion, and isolating landfill
2 materials from the environment.

3
4 **Implementability.** The NFA portion of this alternative would be easy to implement and
5 would not limit or interfere with the ability to perform future remedial actions.

6
7 Surface debris removal can be accomplished using standard construction procedures and
8 conventional earthmoving equipment. Many engineering and construction companies are
9 qualified and available.

10
11 Cover system construction can be accomplished using standard construction procedures
12 and conventional earthmoving equipment. Many engineering and construction companies
13 are qualified to design and construct a landfill cover system. Post-closure monitoring and
14 maintenance are easily implementable. Installation of the cover system could increase the
15 scope of potential future remedial actions at the site, if these actions required access to the
16 debris.

17
18 **Cost.** The capital costs associated with this alternative are low. The associated operating
19 costs low.

20
21 **Conclusion.** This alternative will be retained for detailed evaluation in Section 8.

22
23 **7.2.9 Alternative 3: No Further Action at AOC 41 and SAs 6, 12, and 13; and**
24 **Cap-in-Place at AOCs 9, 11, and 40**

25
26 **Effectiveness.** At SA 6, potential human health and environmental risks have not been
27 evaluated in a PRE or baseline risk assessment, but are considered minimal. Therefore,
28 this alternative is considered to provide limited protection of human health and the
29 environment at SA 6.

30
31 This alternative does not provide protection of human health and the environment at
32 SAs 12 and 13, and AOC 41.

33
34 The long-term effectiveness of a low permeability landfill cover at controlling potential
35 future releases from the unsaturated zone beneath the landfill would depend on the

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1 maintenance of cap integrity. When adequately installed and maintained, low permeability
2 cover systems have a history of effectively reducing surface infiltration to landfill
3 materials, promoting surface water drainage, minimizing erosion, and isolating landfill
4 materials from the environment.

5
6 **Implementability.** The NFA portion of this alternative would be easy to implement and
7 would not limit or interfere with the ability to perform future remedial actions.

8
9 Cover system construction can be accomplished using standard construction procedures
10 and conventional earthmoving equipment. Many engineering and construction companies
11 are qualified to design and construct a landfill cover system. Post-closure monitoring and
12 maintenance are easily implementable. Installation of the cover system could increase the
13 scope of potential future remedial actions at the site, if these actions required access to the
14 debris.

15
16 **Cost.** The capital costs associated with this alternative are moderate. The associated
17 operating costs are moderate.

18
19 **Conclusion.** This alternative will be retained for detailed evaluation in Section 8.

20 21 **7.2.10 Alternative 4: No Further Action at AOC 41 and SAs 6, 12, and 13; and** 22 **Limited Removal at AOC 11 (Disposal in Consolidation Landfill); and** 23 **Excavation and Consolidation of AOCs 9 and 40**

24
25 **Effectiveness.** At SA 6, potential human health and environmental risks have not been
26 evaluated in a PRE or baseline risk assessment, but are considered minimal. Therefore,
27 this alternative is considered to provide limited protection of human health and the
28 environment at SA 6.

29
30 This alternative does not provide protection of human health and the environment at
31 SAs 12 and 13, and AOC 41.

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At AOC 11, removal and disposal of surface debris would remove potential physical hazards to occasional site visitors and reduce human and terrestrial receptor exposure to surface soil, thereby reducing potential risk. Because potential human health risks are within or below the USEPA target values, the human health risk reduction benefit is considered low. No actions would be included to reduce or monitor potential ecological risk from exposure to wetland soil/sediment or surface water.

Excavation of landfill debris would effectively prevent human and ecological exposure and would prevent the landfill from being a potential source of future groundwater contamination. The effectiveness of the consolidation facility at isolating landfill debris would depend on the quality of construction and proper maintenance of cover and leachate collection systems. Landfills that include groundwater protection systems with leachate collection, cover systems, and long-term monitoring and maintenance have a history of effectively isolating wastes from the environment.

Implementability. The NFA portion of this alternative would be easy to implement and would not limit or interfere with the ability to perform future remedial actions.

Surface debris removal can be accomplished using standard construction procedures and conventional earthmoving equipment. Many engineering and construction companies are qualified and available.

Landfill excavation and construction can be accomplished using standard construction procedures and conventional earthmoving equipment, and many engineering and construction companies are qualified and available. Successful implementation of this alternative is contingent on the approval and construction of a consolidation facility to accept the excavated debris. The consolidation facility would be constructed and maintained to effectively isolate landfill debris. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions at the excavated landfill.

Cost. The capital costs associated with this alternative are moderate. The associated operating costs are low.

Conclusion. This alternative will be retained for detailed evaluation in Section 8.

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7.2.11 Alternative 5: Limited Removal at AOC 11 (Disposal in Consolidation Landfill); and Cap-in-Place at AOC 41 and SAs 6, 12, and 13; and Excavation and Consolidation AOCs 9 and 40

Effectiveness. At AOC 11, removal and disposal of surface debris would remove potential physical hazards to occasional site visitors and reduce human and terrestrial receptor exposure to surface soil, thereby reducing potential risk. Because potential human health risks are within or below the USEPA target values, the human health risk reduction benefit is considered low. No actions would be included to reduce or monitor potential ecological risk from exposure to wetland soil/sediment or surface water.

The long-term effectiveness of a low permeability landfill cover at controlling potential future releases from the unsaturated zone beneath the landfill would depend on the maintenance of cap integrity. When adequately installed and maintained, low permeability cover systems have a history of effectively reducing surface infiltration to landfill materials, promoting surface water drainage, minimizing erosion, and isolating landfill materials from the environment.

Excavation of landfill debris would effectively prevent human and ecological exposure and would prevent the landfill from being a potential source of future groundwater contamination. The effectiveness of the consolidation facility at isolating landfill debris would depend on the quality of construction and proper maintenance of cover and leachate collection systems. Landfills that include groundwater protection systems with leachate collection, cover systems, and long-term monitoring and maintenance have a history of effectively isolating wastes from the environment.

Implementability. Surface debris removal can be accomplished using standard construction procedures and conventional earthmoving equipment. Many construction companies are qualified and available.

1 Cover system construction can be accomplished using standard construction procedures
2 and conventional earthmoving equipment. Many engineering and construction companies
3 are qualified to design and construct a landfill cover system. Post-closure monitoring and
4 maintenance are easily implementable. Installation of the cover system could increase the
5 scope of potential future remedial actions at the site, if these actions required access to the
6 debris.

7
8 Landfill excavation and construction can be accomplished using standard construction
9 procedures and conventional earthmoving equipment, and many engineering and
10 construction companies are qualified and available. Successful implementation of this
11 alternative is contingent on the approval and construction of a consolidation facility to
12 accept the excavated debris. The consolidation facility would be constructed and
13 maintained to effectively isolate landfill debris. Implementation of this alternative would
14 not limit or interfere with the ability to perform future remedial actions at the excavated
15 landfill.

16
17 **Cost.** The capital costs associated with this alternative are moderate. The associated
18 operating costs are moderate.

19
20 **Conclusion.** This alternative will be retained for detailed evaluation in Section 8.

21
22 **7.2.12 Alternative 6: Cap-in-Place at AOC 41 and SAs 6, 12, and 13; and**
23 **Excavation and Consolidation of AOCs 9, 11, and 40**

24
25 **Effectiveness.** The long-term effectiveness of a low permeability landfill cover at
26 controlling potential future releases from the unsaturated zone beneath the landfills would
27 depend on the maintenance of cap integrity. When adequately installed and maintained,
28 low permeability cover systems have a history of effectively reducing surface infiltration to
29 landfill materials, promoting surface water drainage, minimizing erosion, and isolating
30 landfill materials from the environment.

31
32 Excavation of landfill debris would effectively prevent human and ecological exposure and
33 would prevent the landfill from being a potential source of future groundwater
34 contamination. The effectiveness of the consolidation facility at isolating landfill debris
35 would depend on the quality of construction and proper maintenance of cover and

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1 leachate collection systems. Landfills that include groundwater protection systems with
2 leachate collection, cover systems, and long-term monitoring and maintenance have a
3 history of effectively isolating wastes from the environment.
4

5 **Implementability.** Cover system construction can be accomplished using standard
6 construction procedures and conventional earthmoving equipment. Many engineering and
7 construction companies are qualified to design and construct a landfill cover system. Post-
8 closure monitoring and maintenance are easily implementable. Installation of the cover
9 system could increase the scope of potential future remedial actions at the site, if these
10 actions required access to the debris.
11

12 Landfill excavation and construction can be accomplished using standard construction
13 procedures and conventional earthmoving equipment, and many engineering and
14 construction companies are qualified and available. Successful implementation of this
15 alternative is contingent on the approval and construction of a consolidation facility to
16 accept the excavated debris. The consolidation facility would be constructed and
17 maintained to effectively isolate landfill debris. Implementation of this alternative would
18 not limit or interfere with the ability to perform future remedial actions at the excavated
19 landfill.
20

21 **Cost.** The capital costs associated with this alternative are high. The associated operating
22 costs are moderate.
23

24 **Conclusion.** This alternative will be retained for detailed evaluation in Section 8.
25

7.2.13 Alternative 7: Cap-in-Place at All Seven Disposal Areas

Effectiveness. The long-term effectiveness of a low permeability landfill cover at controlling potential future releases from the unsaturated zone beneath the landfills would depend on the maintenance of cap integrity. If adequately installed and maintained, low permeability cover systems have a history of effectively reducing surface infiltration to landfill materials, promoting surface water drainage, minimizing erosion, and isolating landfill materials from the environment.

Implementability. Cover system construction can be accomplished using standard construction procedures and conventional earthmoving equipment. Many engineering and construction companies are qualified to design and construct a landfill cover system. Post-closure monitoring and maintenance are easily implementable. Installation of the cover system could increase the scope of potential future remedial actions at the site, if these actions required access to the debris.

Cost. The capital costs associated with this alternative are high. The associated operating costs are high.

Conclusion. This alternative will be retained for detailed evaluation in Section 8.

7.2.14 Alternative 8: Limited removal at AOC 11 (Disposal in Consolidation Landfill); and Excavation and Consolidation of AOCs 9, 40, and 41, and SAs 6, 12, and 13

Effectiveness. At AOC 11, removal and disposal of surface debris would remove potential physical hazards to occasional site visitors and reduce human and terrestrial receptor exposure to surface soil, thereby reducing potential risk. Because potential human health risks are within or below the USEPA target values, the human health risk reduction benefit is considered low. No actions would be included to reduce or monitor potential ecological risk from exposure to wetland soil/sediment or surface water.

Excavation of landfill debris would effectively prevent human and ecological exposure and would prevent the landfill from being a potential source of future groundwater contamination. The effectiveness of the consolidation facility at isolating landfill debris

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1 would depend on the quality of construction and proper maintenance of cover and
2 leachate collection systems. Landfills that include groundwater protection systems with
3 leachate collection, cover systems, and long-term monitoring and maintenance have a
4 history of effectively isolating wastes from the environment.

5
6 **Implementability.** Surface debris removal can be accomplished using standard
7 construction procedures and conventional earthmoving equipment. Many engineering and
8 construction companies are qualified and available.

9
10 Landfill excavation and construction can be accomplished using standard construction
11 procedures and conventional earthmoving equipment, and many engineering and
12 construction companies are qualified and available. Successful implementation of this
13 alternative is contingent on the approval and construction of a consolidation facility to
14 accept the excavated debris. The consolidation facility would be constructed and
15 maintained to effectively isolate landfill debris. Implementation of this alternative would
16 not limit or interfere with the ability to perform future remedial actions at the excavated
17 landfill.

18
19 **Cost.** The capital costs associated with this alternative are high. The associated operating
20 costs are moderate.

21
22 **Conclusion.** This alternative will be retained for detailed evaluation in Section 8.

23 24 **7.2.15 Alternative 9: Excavation and Consolidation of All Seven Disposal Areas**

25
26 **Effectiveness.** Excavation of landfill debris would effectively prevent human and
27 ecological exposure and would prevent the landfill from being a potential source of future
28 groundwater contamination. The effectiveness of the consolidation facility at isolating
29 landfill debris would depend on the quality of construction and proper maintenance of
30 cover and leachate collection systems. Landfills that include groundwater protection
31 systems with leachate collection, cover systems, and long-term monitoring and
32 maintenance have a history of effectively isolating wastes from the environment.

1
2 **Implementability.** Landfill excavation and construction can be accomplished using
3 standard construction procedures and conventional earthmoving equipment, and many
4 engineering and construction companies are qualified and available. Successful
5 implementation of this alternative is contingent on the approval and construction of a
6 consolidation facility to accept the excavated debris. The consolidation facility would be
7 constructed and maintained to effectively isolate landfill debris. Implementation of this
8 alternative would not limit or interfere with the ability to perform future remedial actions
9 at the excavated landfill.

10
11 **Cost.** The capital costs associated with this alternative are high. The associated operating
12 costs are moderate.

13
14 **Conclusion.** This alternative will be retained for detailed evaluation in Section 8.
15

8.0 DETAILED ANALYSIS

This detailed analysis of alternatives provides a description of each candidate landfill remediation alternative and an evaluation using the first seven of the evaluation criteria recommended in USEPA's RI/FS guidance (USEPA, 1988) and described in Table 8-1. The remaining two criteria, state and community acceptance, will be addressed after the public comment period on the proposed plan. The nine alternatives that are evaluated in this section are those remaining after screening in Section 7 and listed in Table 7-3.

Alternative 1: No Further Action

Alternative 2: No Further Action at AOC 41, and SAs 6, 12, and 13;
Limited Removal at AOC 11 (Disposal at AOC 9); and
Cap-in-Place at AOCs 9 and 40

Alternative 3: No Further Action at AOC 41 and SAs 6, 12, and 13; and
Cap-in-Place at AOCs 9, 11, and 40

Alternative 4: No Further Action at AOC 41 and SAs 6, 12, and 13;
Limited Removal at AOC 11 (Disposal in Consolidation Landfill); and
Excavation and Consolidation of AOCs 9 and 40

Alternative 5: Limited Removal at AOC 11 (Disposal in Consolidation Landfill); and
Cap-in-Place at AOC 41 and SAs 6, 12, and 13; and
Excavation and Consolidation of AOCs 9 and 40

Alternative 6: Cap-in-Place at AOC 41 and SAs 6, 12, and 13; and
Excavation and Consolidation of AOCs 9, 11, and 40

Alternative 7: Cap-in-Place at All Seven Disposal Areas

Alternative 8: Limited Removal at AOC 11 (Disposal in Consolidation Landfill); and
Excavation and Consolidation of AOCs 9, 40, and 41, and SAs 6, 12, and
13

Alternative 9: Excavation and Consolidation of All Seven Disposal Areas

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8.1 ALTERNATIVE 1: NO FURTHER ACTION

This subsection describes the NFA Alternative and evaluates the alternative using the seven evaluation criteria.

8.1.1 Description of Alternative 1

The NFA Alternative serves as a baseline alternative with which to compare other alternatives per CERCLA regulations. No action will be taken to meet the response objectives stated in Section 5.

8.1.2 Detailed Evaluation of Alternative 1

The following subsections present an assessment of this alternative according to the seven evaluation criteria.

8.1.2.1 Overall Protection of Human Health and the Environment. The following paragraphs assess how the proposed actions of the NFA Alternative would provide protection of human health and the environment.

SA 6. Potential human health and environmental risks have not been evaluated in a PRE or baseline risk assessment, but are considered minimal. Therefore, this alternative is considered to provide limited protection of human health and the environment at SA 6.

AOC 9. This alternative does not include actions to provide protection of human health and the environment at AOC 9. However, the Army interprets both the contribution to potential risks by AOC 9 and the risk reduction benefit of remedial action at AOC 9 to be low. The human health PRE for surface water and sediment is based on comparison to drinking water and soil benchmarks values, respectively, and likely overestimates potential risks. Although the concentrations of contaminants in unfiltered groundwater samples exceed benchmark values, entrained soil particles in the samples may have contributed to the exceedances, and groundwater with high entrained solids concentrations would be unlikely to be used as a drinking water source. Further, monitoring data indicate that

1 exceedances occurred in samples collected both upgradient and crossgradient of AOC 9,
2 suggesting that AOC 9 is not the source of the exceedances. The USEPA, however, does
3 not concur and recommends that remedial response action be taken to reduce potential
4 risks at AOC 9.

5
6 AOC 11, SA 12, SA 13, AOC 40, and AOC 41. This alternative does not provide
7 protection of human health and the environment at these areas.

8
9 **8.1.2.2 Compliance with ARARs.** The NFA Alternative does not include any remedial
10 actions and would not trigger any location-specific ARARs.

11
12 The National Primary Drinking Water Regulations (40 CFR Parts 141.11-141.16 and
13 141.50-141.53) are chemical-specific ARARs at AOC 40. Under Alternative 1, the MCL
14 for BEHP would be met under average conditions, and the MCL for arsenic would be met
15 under average and maximum conditions. Available data indicate that MCLs are not
16 exceeded at the Patton Well.

17
18 The following federal and Massachusetts landfill closure regulations are appropriate for
19 consideration as potential action-specific ARARs for the seven disposal areas discussed in
20 this FS.

- 21
22 • USEPA Criteria for Municipal Solid Waste Landfills at 40 CFR Part 258
23
24 • Massachusetts Solid Waste Management Regulations at 310 CMR 19.000
25
26 • USEPA Regulations for Owners and Operators of Permitted Hazardous Waste
27 Facilities at 40 CFR Part 264
28
29 • Massachusetts Hazardous Waste Management Rules at 310 CMR 30.000
30

31 USEPA regulations at 40 CFR Part 258 establish minimum national criteria under RCRA
32 for municipal solid waste units. However, USEPA has delegated authority to MADEP to
33 regulate municipal solid waste units in Massachusetts; therefore, USEPA regulations at 40
34 CFR Part 258 are not considered ARARs.

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The Massachusetts Solid Waste Management Regulations at 310 CMR 19.000 regulate the storage, transfer, processing, treatment, disposal, use, and reuse of solid waste in Massachusetts. These regulations were adopted effective July 1, 1990 and contain specific detailed provisions for facilities in use on or after that date. For facilities that ceased operation prior to July 1, 1990 but after April 21, 1971, (i.e., inactive landfills), the regulations at 310 CMR 19.021(4)(a) require proof of closure in accordance with a plan approved by the MADEP or submittal of a final closure and post-closure plan in accordance with 310 CMR 19.030(3)(c)5. For landfills that ceased operation prior to April 21, 1971 (also classified as inactive landfills), the regulations at 310 CMR 19.021(4)(b) indicate that preparation and submittal of final closure and post-closure plans may be required if so ordered by the MADEP.

As shown in the following table, disposal at AOC 9, AOC 11, and SA 12 ceased between April 1971 and July 1990; 310 CMR 19.021(4)(a) is considered applicable for these inactive disposal areas. The remaining four disposal areas ceased operation prior to April 1971. Further, MADEP has not issued an order for preparation of final closure and post-closure plans for these four disposal areas. Therefore, 310 CMR 19.021(4)(b) is considered relevant and appropriate for SA 6, SA 13, AOC 40, and AOC 41.

DISPOSAL AREA	CESSATION OF OPERATIONS	REGULATORY STATUS
SA 6	1920	310 CMR 19.021(4)(b), relevant and appropriate
AOC 9	1978	310 CMR 19.021(4)(a), applicable
AOC 11	1980	310 CMR 19.021(4)(a), applicable
SA 12	1982	310 CMR 19.021(4)(a), applicable
SA 13	1970	310 CMR 19.021(4)(b), relevant and appropriate
AOC 40	late 1960s	310 CMR 19.021(4)(b), relevant and appropriate
AOC 41	1950s	310 CMR 19.021(4)(b), relevant and appropriate

Under Alternative 1, the requirements of 310 CMR 19.021(4)(a) would not be met for disposal areas at AOC 9, AOC 11, or SA 12. The SI, RI, and FS reports and the ROD would be submitted to satisfy 310 CMR 19.021(4)(b) at SA 6, SA 13, AOC 40, and AOC 41.

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USEPA regulations at 40 CFR Part 264 establish criteria for the treatment, storage, and disposal of hazardous wastes. To be applicable to a CERCLA remedial action, the following criteria must be met:

the waste is a RCRA hazardous waste, and either:

- 1) the waste was initially treated, stored, or disposed of after November 19, the effective date of CERCLA regulation, or
- 2) the activity at the CERCLA site constitutes treatment, storage, or disposal.

The wastes at the seven disposal areas have not been shown to be, or identified as, hazardous wastes, and in six of seven instances wastes were disposed of prior to 1980. USEPA hazardous waste regulations at 40 CFR Part 264 are not considered ARARs.

Massachusetts Hazardous Waste Management Rules at 310 CMR 30.000 regulate the generation, storage, collection, transport, treatment, disposal, use, reuse, and recycling of hazardous materials in Massachusetts. Because wastes at the seven disposal sites have not been identified as hazardous, 310 CMR 30.000 is not considered an ARAR.

8.1.2.3 Long-term Effectiveness and Permanence. The following paragraphs assess the long-term effectiveness and permanence of the proposed actions of the NFA Alternative.

SA 6. This alternative may not provide long-term effectiveness at controlling potential human health and environmental risks at SA 6, because undefined site risks may exist.

AOC 9. As stated in Subsection 8.1.2.1, the Army interprets the risk reduction benefits of remedial response action at AOC 9 to be low. Therefore, this alternative is interpreted to provide long-term effectiveness at controlling site risks.

AOC 11, SA 12, SA 13, AOC 40, and AOC 41. This alternative would not provide long-term effectiveness at controlling potential human health or environmental risks at these areas.

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1 **8.1.2.4 Reduction of Toxicity, Mobility, and Volume Through Treatment.** The
2 following paragraphs assess the reduction of toxicity, mobility, and volume of
3 contaminants through treatment offered by the proposed actions of the NFA Alternative.

4
5 SA 6, AOC 9, AOC 11, SA 12, SA 13, AOC 40, and AOC 41. This alternative would not
6 use removal, containment, or treatment processes to address contamination at this site.
7 No reduction of toxicity, mobility, or volume of contaminants through treatment would
8 occur. This alternative would not satisfy the statutory preference for treatment as a
9 component of remedial actions.

10
11 **8.1.2.5 Short-term Effectiveness.** The following paragraphs assess the short-term
12 effectiveness of NFA proposed at each of the landfills.

13
14 SA 6, AOC 9, AOC 11, SA 12, SA 13, AOC 40, and AOC 41. This alternative would not
15 provide any remedial actions. Therefore, no short-term risks to the community or
16 environment would result from implementation.

17
18 **8.1.2.6 Implementability.** The following paragraphs assess the implementability of NFA
19 proposed at each of the landfills.

20
21 SA 6, AOC 9, AOC 11, SA 12, SA 13, AOC 40, and AOC 41. This alternative would be
22 easy to implement and would not limit or interfere with the ability to perform future
23 remedial actions.

24
25 **8.1.2.7 Cost.** Because no action would be taken, there are no capital or operation and
26 maintenance costs associated with this alternative.

27
28
29 **8.2 ALTERNATIVE 2: NO FURTHER ACTION AT AOC 41, AND SAs 6, 12, AND**
30 **13; LIMITED REMOVAL AT AOC 11 (DISPOSAL AT AOC 9); AND CAP-IN-**
31 **PLACE AT AOCs 9 AND 40**
32

1 This subsection describes and evaluates Alternative 2 using the seven evaluation criteria,
2 and provides a cost estimate.

3 4 **8.2.1 Description of Alternative 2**

5
6 This alternative includes different types of management at the seven disposal sites. At
7 AOC 41, and SAs 6, 12, and 13 NFA would be taken. At AOC 11 only surface debris
8 would be removed for disposal at AOC 9. At AOCs 9 and 40 a cap would be placed over
9 the debris. AOC 9 will have some consolidation of debris, which will minimize both the
10 area to be capped, and associated costs. The debris collected from AOC 11 would be
11 placed under this cap. Alternative 2 also includes removing exposed drums at AOC 40 to
12 remove a potential source of contamination, and excavation of sediment from two hot
13 spots in Cold Spring Brook Pond to reduce ecological risk from exposure to contaminated
14 sediments. These actions at AOC 40 were described previously in the FS for AOC 40
15 (ABB-ES, 1994b).

16
17 Key components of Alternative 2 include:

18 19 No Further Action at AOC 41, SAs 6, 12, 13

- 20
21 • No action.

22 23 Limited Removal at AOC 11

- 24
25 • Mobilization/demobilization;
26 • Excavation of debris and transportation to AOC 9;
27 • Backfilling site; and
28 • Site restoration.

29 30 Cap-in-Place AOCs 9 and 40

- 31
32 • Mobilization/demobilization;
33 • Site preparation;
34 • Sediment removal and disposal at AOC 40;
35 • Drum removal and disposal at AOC 40;

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- Consolidate debris at AOC 9;
- Cap construction;
- Site restoration;
- Wetland restoration;
- Institutional controls;
- Cover system monitoring and maintenance; and
- Five-year site reviews.

Each of these actions is described below:

8.2.1.1 Description of No Further Action Components for Alternative 2. The NFA components are similar to those discussed for Alternative 1, Subsection 8.1.1.

8.2.1.2 Description of Limited Removal Components for Alternative 2.

Mobilization/demobilization. Excavation and backfill equipment including backhoes, front end loaders, and dump trucks would be mobilized to AOC 11 to remove surface debris and transport it to AOC 9. There would be minimal disruption to AOC 11. Clearing is not anticipated and no roads would be constructed.

Excavation of debris and transportation to AOC 9. Excavation at AOC 11 would be limited to surface debris and refuse. The 2+ acres of level area and the 10-foot banking along the south wetlands have exposed refuse including large pieces of metal, wood, bricks, and other construction debris. Clearing the landfill surfaces of trees and brush would be minimal. Individual protruding debris items would be removed by excavators of appropriate size, and hauled by truck to AOC 9, where it would be placed prior to cap installation. About 500 cy would be handled. Silt fences may be installed along the wetlands, to be removed after construction. No change in the wetlands footprint would result after the landfill banking was regraded and revegetated. Disturbed wetlands would be cleared of construction materials and left for natural revegetation.

1 Backfilling site. The excavated/disturbed areas of AOC 11 would be backfilled with
2 vegetative soil and graded.

3
4 Site restoration. The site would then be restored by seeding, mulching, and fertilizing the
5 disturbed areas. Wetlands would be left for natural revegetation.

7 **8.2.1.3 Description of Cap-In-Place Components for Alternative 2.**

8
9 Mobilization/demobilization. Excavation and backfill equipment including backhoes,
10 bulldozers, and rollers would be mobilized at AOC 9 and AOC 40. Specialized equipment
11 may be required for cap construction at AOC 40, due to steep banks and heavy debris at
12 the bottom of the slopes at this area. Additional sediment removal equipment requiring
13 mobilization at AOC 40 includes an excavator or a clamshell crane, watertight dump
14 trucks, and water storage tanks. A plan view of AOC 9 is shown on Figure 8-1, and a
15 cross-section view on Figure 8-2. A plan view of AOC 40 is shown on Figure 8-3; a
16 cross-section view of AOC 40 is shown on Figure 8-4.

17
18 Site Preparation. Initial activities at both AOC 9 and AOC 40 would be some clearing of
19 trees, constructing temporary access roads, and installing silt fences and erosion control
20 measures. Contractor trailers with utilities would be established, and parking and staging
21 areas prepared.

22
23 At AOC 40, Cold Spring Brook Landfill, drum removal would be attempted by hydraulic
24 excavator or backhoe from the landfill surface. Some tree removal and minor regrading of
25 the landfill surface may be needed to accomplish this task. Sediment removal from
26 sediment Area I would also be attempted from the landfill surface. The most direct access
27 to sediment Area I from Patton Road would be to cross the landfill east of well
28 CSM-93-01A. However, the landfill surface is relatively high in this area and it may not
29 be possible to reach the entire sediment removal area. As an alternative, approaching the
30 sediment removal area via a more easterly route may make sense. The pond bank is lower
31 and the debris/rubble would provide a relatively firm foundation for excavation equipment.
32 Even with this approach, construction of up to 200 ft of temporary road along the edge of
33 the pond/landfill may be necessary. A third alternative would be to construct
34 approximately 500 ft of temporary access road along the northwestern side of the landfill.
35 Construction of either access road would likely require placement of a geotextile mat and

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1 significant quantities of gravel over the naturally occurring peat to support heavy
2 equipment. Construction of the longer road would also require removal of a number of
3 trees. As indicated in Figure 8-3, it may be possible to construct the road along the
4 northwest edge of the landfill without crossing wetland areas. However, this would need
5 to be confirmed. The cost estimates for sediment removal at Area I are based on
6 construction and subsequent removal of 200 ft of temporary access road.

7
8 Prior to excavation at sediment Area II near the outlet of Cold Spring Brook Pond, some
9 fill material may need to be placed along the bank of the pond to provide a level platform
10 for equipment. Access would be from Patton Road east of the pond. For cost estimating
11 purposes, it is assumed that gravel would be obtained on-site from the southern side of
12 Patton Road to construct the work platforms and access roads. If this gravel cannot be
13 used, material costs would increase. These access roads would be temporary, and would
14 be removed following completion of remedial activities at the landfill. The cost estimates
15 include the cost to remove any temporary roads or work platforms at Area II.

16
17 Construction of a lined basin for dewatering sediment, a lined drum storage area for
18 staging drums, small decontamination pads, a stockpile area approximately 1 acre in size
19 for cover system materials, and a small parking area would be required.

20
21 Partial dewatering of Cold Spring Brook Pond may be required prior to cap construction.

22
23 Sediment removal and disposal at AOC 40 Sediment removal is proposed at AOC 40 for
24 two hot spot locations producing elevated ecological risks due to arsenic and lead
25 contamination in Cold Spring Brook Pond. The first location (Area I) is a small inlet east
26 of monitoring well CSB-2 (see Figure 8-3). The second location (Area II) is at the pond
27 outlet. For cost estimating purposes, the volume of sediment to be removed has been
28 estimated to be 1,200 cy.

29
30 A silt fence or a floating boom weighted at its bottom would be placed around the two
31 excavation areas to prevent sediment suspended during excavation from migrating to other
32 locations in the pond. Sediment removal would be attempted by a long-stick hydraulic
33 excavator or a crane with a watertight clamshell bucket to minimize the quantity of water

1 and sediment spilling adjacent to the excavation. If access from the top of the landfill is
2 not successful, a temporary access road would be constructed along the northern side of
3 the landfill, and sediment would be removed with an excavator. Sediment would be
4 placed in watertight dump trucks and transported to a lined dewatering basin constructed
5 as close to the landfill area as practicable. For cost estimating purposes, the lined
6 dewatering basin is proposed to be 100 by 100 ft with a 4 ft. depth, constructed with an
7 impervious liner to temporarily store sediment and water.

8
9 As the sediment settles out, the supernatant water would be pumped into tanks and
10 sampled. If analysis shows that the water will not cause Cold Spring Brook Pond to
11 exceed AWQC, it would be discharged back to the pond. If water quality does not meet
12 acceptable criteria, it would be treated on-site in a mobile clarifier before discharge to the
13 pond. Sediments would be disposed at AOC 9. The addition of a sorbent or solidifying
14 agent may be necessary to eliminate free water prior to transport and disposal. For cost
15 estimating purposes, treatment of supernatant water is assumed.

16
17 Drum removal and disposal at AOC 40. At AOC 40, 14 55-gallon drums along the
18 northern edge of Cold Spring Brook Landfill would be removed. Drums are located on
19 the landfill bank, as well as partially submerged in the pond (see Figure 8-3). Drum
20 removal would be attempted with a backhoe or hydraulic excavator working from cleared
21 areas on top of the landfill.

22
23 Drums with contents would be lifted manually or by means of a sling, and overpacked into
24 85-gallon drums. These drums would then be removed and staged on a lined, bermed,
25 on-site staging area approximately 400 square ft in size. Drum contents would be sampled
26 and analyzed for TCLP constituents following drum staging. After TCLP results are
27 obtained, the drums would be disposed at AOC 9 or an off-site RCRA Treatment,
28 Storage, or Disposal (TSD) facility. Empty drums would be placed in polybags and taken
29 to AOC 9.

30
31 Consolidate debris areas at AOC 9. AOC 9, shown on Figure 8-1, consists of five
32 separate areas. In this alternative, the four smaller peripheral areas would be excavated
33 using standard excavation equipment (e.g., hydraulic excavators) and spread and
34 compacted over existing grades in the large area. Consolidation will minimize the size of
35 the cap at AOC 9 and the corresponding costs. The debris from the peripheral AOC 9

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1 areas, as well as the debris from the limited removal at AOC 11, can be used to minimize
2 the amount of subgrade fill required to create the proper grades for the cap at AOC 9.

3
4 Cap Construction. To conform with the intent of regulations 310 CMR 19.112: a landfill
5 cover must meet six general performance standards:

- 6
- 7 • minimize surface water infiltration to landfilled material
- 8 • promote surface water drainage
- 9 • minimize erosion
- 10 • facilitate venting and control of landfill gas
- 11 • isolate landfilled material from the environment
- 12 • accommodate settling and subsidence
- 13

14 The regulations also provide general design and component standards to achieve the
15 performance standards. The conceptual cover system design for AOC 9 would conform
16 to the general design standards in regard to final top slope, side slope and layer
17 construction. Because of the age and nature of the landfill debris, landfill gas generation is
18 not expected, and gas vents are not included. A cross section of the cap is shown on
19 Figure 8-5.

20
21 The conceptual cover system design for AOC 40 is intended to achieve the performance
22 standards, but varies slightly from the general design standards. A cross section of the cap
23 is shown on Figure 8-4. Several factors combine to require a special approach to top slope
24 and side slope design:

- 25
- 26 • the proximity of Patton Road
- 27
- 28 • the shallow slope of the existing landfill surface
- 29
- 30 • the interpreted northward flow of groundwater beneath the landfill and
- 31 discharge to Cold Spring Brook Pond
- 32

- the landfilled debris that extend into the pond along much of the landfill's northern boundary

These factors create two special design constraints. The first constraint is the need to minimize the diversion of surface water from the landfill cover toward Patton Road, and the second is to not interrupt the continued discharge of groundwater to the pond. The closeness of the landfill to the road and the similarities in surface elevation make construction of drainage ditches, especially open, lined ditches, problematic. To minimize the southward diversion of surface water, this alternative proposes to hold cover system buildup to a minimum. It may also be necessary to incorporate surface slopes of less than 5 percent. The narrowness of the landfill will help promote adequate lateral drainage at shallow slopes. Minimizing the buildup of the landfill surface in the middle of the landfill and reducing final top slope can be achieved by increasing side slope and thereby reducing the volume of waste pullback. (It is assumed that material pulled back from the sides would be placed on top of the landfill). Side slope design to prevent instability will be considered as part of the design to address the second special design constraint, continued groundwater passage.

Maintenance of normal groundwater flow is an important design consideration. Construction of low permeability cap on the north side of the landfill would block groundwater discharge to the pond and could have several adverse effects.

- The water balance of the pond would change. A reduced groundwater discharge to the pond could result in lower water levels, reduced water quality, and adverse ecological effects.
- Buildup of groundwater behind low permeability side slope cover would result in unbalanced hydrostatic heads and could contribute to side slope cover failure.
- Buildup of groundwater behind low permeability side slope cover has the potential to increase contact between debris and groundwater and the possibility of leaching.

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- The effect of raising the water table in the vicinity of the landfill on groundwater quality at Patton Well is not known.

To maintain undisturbed groundwater discharge to Cold Spring Brook Pond, it is proposed to construct a riprap side slope on the north side of the landfill. A trench would be excavated through the layer of sediment at the bottom of the pond to the underlying sand layer to provide a stable footing for the riprap. A representative cross section through the proposed cover system showing a conceptual layout of the cover system north side slope is shown in Figure 8-5. It is proposed that the riprap slope extend as high as possible, at a slope of 1.5 or 2 to 1 and that areas with 3 to 1 slope be held to a minimum. Use of riprap material should enable construction of a stable slope steeper than 3 to 1. During the cover system design, a natural filter should be designed to prevent siltation or erosion below the groundwater table. In addition, the weight of the cover system layers and the groundwater uplift pressures should be compared to determine if the cover system needs to be thicker or if the geomembrane requires anchoring.

The proposed design does not include a gas venting layer because the construction debris in the Cold Spring Brook Landfill is not anticipated to generate landfill gas. Furthermore, the proposed placement of riprap on the north side of the landfill would allow landfill gas to escape and prevent gas accumulation, achieving the intent of 310 CMR 19.112.

To meet the desired performance standards, the proposed cover system would consist of the following components from bottom to top:

- subgrade fill
- geomembrane
- drainage layer
- geotextile
- moisture retention layer
- vegetative cover layer

1 Prior to placement of cover system layers, trees on the landfill surface would be cleared.
2 In addition, grading of the landfill material and surface soil and addition of clean subgrade
3 fill would be required to achieve cover design slopes. Subgrade fill would be free of
4 materials that may damage or abrade the geomembrane and be of sufficient thickness to
5 collect all solid waste. Regulations 310 CMR 19.112 specify a minimum top slope of
6 5 percent, and a maximum side slope of three horizontal to one vertical. However, as
7 discussed previously, a more shallow top slope and a steeper side slope are proposed for
8 at Cold Spring Brook Landfill. In addition to achieving required slopes, grading would
9 cover or move any pieces of concrete or metal protruding from the surface of the landfill,
10 and would sufficiently fill void spaces in the upper portion of the debris to create a stable
11 base on which to place the cover system. Because of the makeup and age of the landfill
12 debris, problems are not expected from future settling and subsidence. To grade the
13 landfill surface effectively, some of the larger pieces of concrete and asphalt pavement may
14 need to be broken up.

15
16 The majority of the cover system can be placed with equipment working from the graded
17 landfill surface. However, to complete the cover system at the toe of the slope, a
18 temporary access road may be required along the northeastern edge of the landfill, within
19 the limits of Cold Spring Brook Pond. To construct this access road, the pond may
20 require partial dewatering, or, alternately, installation of coffer dams and groundwater
21 pumping to enable access by construction equipment.

22
23 To promote stormwater runoff from the cover system, top slopes would be graded down
24 to the north, east and west as much as feasible. Little stormwater run-on to the cover
25 system is anticipated from Patton Road and areas south of the landfill because the soil in
26 the vicinity is sandy. A shallow, unlined drainage swale could be constructed along the
27 southern edge of the cover system to direct stormwater from Patton Road around the
28 cover system to Cold Spring Brook Pond (see Figure 8-3). However, runoff from the
29 cover would be expected to infiltrate rapidly, pre-empting the need for the drainage swale
30 in the first place. Stormwater calculations would be conducted during design to determine
31 the required extent of stormwater controls.

32
33 A textured geomembrane is proposed for the hydraulic barrier of the landfill cover. The
34 hydraulic barrier would have a maximum in-place saturated hydraulic conductivity of
35 1×10^{-7} centimeter per second (cm/sec) and be placed above the subgrade fill.

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1
2 A 12-inch minimum thickness drainage layer with a minimum hydraulic conductivity of
3 1×10^{-3} cm/sec would be placed above the geomembrane to promote lateral drainage and
4 minimize accumulation of water above the geomembrane. The drainage layer would direct
5 intercepted infiltration to the perimeter of the cover and ultimately to Cold Spring Brook
6 Pond.

7
8 A layer of geotextile will be placed above the drainage layer to prevent the migration of
9 fines to the drainage layer.

10
11 An 18-inch layer of moisture retention soil will be placed above the geotextile. The
12 moisture retention layer will protect underlying layers from the adverse effects of
13 desiccation, extreme temperatures, frost, and erosion.

14
15 A 6-inch layer of soil capable of supporting grass growth would be placed above the filter
16 layer. This soil should contain some fines to improve its capacity to hold water, and it
17 would be seeded, fertilized and mulched to promote a stable vegetative cover.

18
19 This cover system results in a total soil thickness of 36 inches above the hydraulic barrier
20 layer. This is less than the estimated frost depth for central Massachusetts of
21 approximately 4 feet (U.S. Navy, 1982); however, the performance of geomembrane
22 layers is not as sensitive to frost as is clay or clay/soil barriers.

23
24 The Army believes this conceptual design meets the general performance standards of 310
25 CMR 19.112. The conceptual design would be reviewed and refined during the final
26 design phase to optimize the balance between top/side slopes and runoff/drainage
27 concerns.

28
29 For the cost estimating purposes of this FS, cover system material quantities have been
30 estimated to include an extension of the cover system layers beyond the limits of landfill
31 debris.
32

1 Site restoration. The AOC 9 and AOC 40 sites will be restored by seeding, mulching, and
2 fertilizing the disturbed areas. Wetlands will be left for natural revegetation.

3
4 Wetlands Restoration. Remedial activities at AOC 9 and AOC 40 will occupy bordering
5 wetland areas which would be restored in accordance with a Wetland Restoration
6 Specification (WRS) prepared prior to any wetland restoration.

7
8 At AOC 40, the northern edge of the low-permeability cover system, and the additional
9 length of access road proposed for this alternative would extend beyond the limits of the
10 landfill into Cold Spring Brook Pond. Areas of sediment excavation, temporary access
11 road construction, and ditch excavation at the toe of the cover system would be backfilled
12 and graded, and some areas potentially revegetated. For cost estimating purposes, the
13 extent of wetland restoration associated with landfill capping and sediment removal is
14 assumed to be approximately 1.5 acres. This area would increase to an estimated
15 2.5 acres of the landfill was excavated for subsequent disposal/consolidation. The WRS
16 would incorporate guidelines from the Massachusetts Wetland Protection Act and
17 Regulations, specifically 310 CMR 10.55. The primary goal of wetland restoration
18 activities at Cold Spring Brook Pond and the surrounding wetland area would be to
19 restore self-sustaining freshwater wetlands in situ (i.e., in the same "footprint" as the
20 altered wetlands).

21
22 Restoration of wetlands at Cold Spring Brook Pond would:

- 23
24 • reduce the long-term impacts of activities in and adjacent to the wetlands;
25
26 • compensate for losses of wetland habitats;
27
28 • restore or replace degraded wetlands; and
29
30 • meet state and federal permitting and regulatory guidelines and
31 requirements.

32
33 At Cold Spring Brook Pond and the surrounding wetland area, it is anticipated that
34 required wetland restoration would be relatively minor. The areas of sediment excavation
35 within the pond would require backfilling to pre-remediation grade. Restoration in the

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1 wetland area on the northwest side of Cold Spring Brook Landfill, where an access road
2 may be placed, would require removal of road materials, backfilling and grading to match
3 the pre-remediation grade, and potentially revegetating the disturbed area.

4
5 Based on regulatory guidelines, including 310 CMR 10.55 and wetlands regulations
6 regarding restoration, the WRS should include: careful consideration of Cold Spring
7 Brook Pond hydrology, topography, vegetation, and soil characteristics; evaluation of
8 wetlands functional assessment; examination of regional wetlands replacement literature;
9 consultation with regulatory and technical authorities; and experience with similar wetland
10 restoration projects. This WRS would be prepared in accordance with state and federal
11 technical requirements for wetland alteration. Development of the WRS may depend on
12 terms described in the IAG between the U.S. Army and the USEPA (USEPA, 1991b).
13 The WRS would include a detailed description of all proposed activities, a discussion of
14 goals based on wetland functional attributes, and a long-term monitoring plan (which
15 would be combined with the proposed biomonitoring).

16
17 The goal of wetlands restoration would be to restore the wetland within the same footprint
18 to achieve at a minimum, the same values and functions as determined by the evaluation
19 used to assess the functions and values of the Cold Spring Brook wetland.

20
21 It is difficult to estimate the costs of implementing the WRS until it has been developed
22 and approved, and state and federal regulatory requirements are better defined. For cost-
23 estimating purposes of this FS, a cost of \$50,000 per acre is assumed for wetland
24 restoration activities, including soil replacement, revegetation, monitoring, and
25 maintenance.

26
27 Institutional Controls. Institutional controls for AOC 9 and AOC 40 are proposed in the
28 form of land use restrictions for any property released by the U.S. Army during Fort
29 Devens base closure activities. The Devens Reuse Plan, Main and North Posts (VHB,
30 1994) has proposed that U.S. Army land north of Patton Road, including Cold Spring
31 Brook Landfill and Cold Spring Brook Pond, would be zoned as open space.

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1 By preempting residential use, these controls will help limit human exposure. In addition,
2 the U.S. Army will place land use restrictions at AOCs 9, 11, and 40 in conformance with
3 310 CMR 19.141. This, in combination with long-term groundwater monitoring, would
4 protect potential human receptors from potential future releases to groundwater. These
5 controls would be drafted, implemented and enforced in cooperation with state and local
6 government.

7
8 Cover System Monitoring and Maintenance. Massachusetts Solid Waste Management
9 Regulations (310 CMR 19.142) require the post-closure monitoring period to extend a
10 minimum of 30 years. Proposed cover system monitoring and maintenance at AOC 9 and
11 AOC 40 would consist of conducting annual site inspections, performing needed cover
12 system repairs, and mowing.

13
14 Inspections would be conducted to ensure the integrity of the landfill cover system layers,
15 surface water diversion trenches, monitoring wells, access roads, and the general site
16 conditions. Required maintenance activities would be proposed and conducted based on
17 information from site inspections.

18
19 Groundwater monitoring is proposed to confirm that groundwater quality will remain
20 acceptable over time. For AOC 9, a minimum of one upgradient and three downgradient
21 monitoring wells is assumed for cost estimating. All monitoring wells would be sampled
22 and analyzed semi-annually consistent with the monitoring requirements of 310 CMR
23 19.132 for a minimum of 30 years. Assumptions made for this monitoring plan are for
24 cost estimating purposes only. A final detailed monitoring plan would be developed in
25 conjunction with regulatory agency review and comment.

26
27 At Cold Spring Brook Landfill, AOC 40, extra monitoring wells would be used to detect
28 potential contaminant migration toward Patton Well. Five existing monitoring wells,
29 CSB-1, CSB-2, CSB-3, CSM-93-2A, and CSM-93-02B, plus the two newly installed
30 downgradient wells, would be sampled and analyzed semi-annually.

31
32 Landfill gas monitoring is not proposed at Cold Spring Brook Landfill. The construction
33 debris at the landfill is not expected to generate landfill gas, and ambient air monitoring
34 during the RI did not identify VOCs above background at the landfill.

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1 Five-year Site Reviews. Under CERCLA 121c, any remedial action (or lack thereof) that
2 results in contaminants remaining on-site must be reviewed at least every five years. Data
3 collected during the groundwater monitoring program would provide information for
4 these reviews. The reviews would evaluate whether Alternative 2 is protective of human
5 health and the environment and whether additional remedial actions should be initiated.

6 7 **8.2.2 Detailed Evaluation of Alternative 2**

8
9 The following subsections present an assessment of Alternative 2 according to the seven
10 evaluation criteria.

11
12 **8.2.2.1 Overall Protection of Human Health and the Environment.** The following
13 paragraphs assess how the proposed actions of Alternative 2 would provide protection of
14 human health and the environment.

15
16 SA 6. Overall protection of human health and the environment is similar to that discussed
17 for the NFA Alternative in Subsection 8.1.2.1.

18
19 AOC 9. Installation of a low permeability cover at AOC 9 would remove potential
20 physical hazards to occasional site visitors, limit human and ecological exposure to surface
21 soils, and reduce infiltration of precipitation which could potentially leach contaminants
22 from landfill debris and contaminate groundwater. Implementation of a long-term
23 groundwater monitoring program and five-year site review would provide a means to
24 assess the affect of potential future releases of contaminants on groundwater. Because the
25 PRE did not identify significant potential for human or ecological exposure risk at AOC 9,
26 the risk-reduction benefit from capping AOC 9 is considered low.

27
28 AOC 11. Removal and disposal of surface debris would remove potential physical hazards
29 to occasional site visitors and reduce human and terrestrial receptor exposure to surface
30 soil, thereby reducing potential risk. Because potential human health risks were within or
31 below the USEPA target values, the human health risk-reduction benefit is considered
32 low. No actions would be included to reduce or monitor potential ecological risk from
33 exposure to wetland soil/sediment or surface water.

1
2 SA 12. Similar to the NFA Alternative, this alternative would not provide protection of
3 human health and the environment.
4

5 SA 13. Similar to the NFA Alternative, this alternative would not provide protection of
6 human health and the environment.
7

8 AOC 40. Alternative 2 has significant potential for protecting human health and the
9 environment under both current and future land use conditions. As stated previously, no
10 current residential groundwater exposure or risk exists at Cold Spring Brook Landfill.
11

12 This alternative relies on institutional controls in the form of land use restrictions to
13 control potential future residential exposure to groundwater at Cold Spring Brook
14 Landfill. Removal and disposal of discarded 55-gallon drums would remove associated
15 physical hazards and prevent them from acting as a potential source of soil or water
16 contamination.
17

18 Installation of a low permeability cover at AOC 40 would remove potential physical
19 hazards to occasional site visitors, limit human and ecological exposure to surface soils,
20 and reduce infiltration of precipitation which could potentially leach contaminants from
21 landfill debris and contaminate groundwater, surface water, and sediments. The baseline
22 risk assessment did not identify significant potential risk from exposure to surface soil;
23 however, potential groundwater, surface water, and sediment contamination is a concern.
24 Alternative 2 would provide protection of the Patton Well by installing two additional
25 monitoring wells between Patton Well and the landfill and providing long-term monitoring
26 of these and other Cold Spring Brook Landfill monitoring wells. Implementation of a
27 long-term groundwater monitoring program and five-year site reviews would provide a
28 means to assess the affect of potential future releases of contaminants on groundwater as
29 well as monitor potential migration of contaminants toward Patton Well.
30

31 Removing sediment from Cold Spring Brook Pond would reduce potential ecological risk
32 from exposure to those sediments.
33

34 AOC 41. Similar to the NFA Alternative, this alternative would not provide protection of
35 human health and the environment.

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1
2 **8.2.2.2 Compliance with ARARs.** Tables 8-2, 8-3, and 8-4 summarize how Alternative
3 2 will attain ARARs.

4
5 **8.2.2.3 Long-term Effectiveness and Permanence.** The following paragraphs assess
6 the long-term effectiveness and permanence of the proposed actions of Alternative 2.

7
8 SA 6. The long-term effectiveness of this alternative is similar to that discussed for the
9 NFA Alternative in Subsection 8.1.2.1.

10
11 AOC 9. The long-term effectiveness of a low permeability landfill cover at controlling
12 potential future releases from the unsaturated zone beneath the landfill would depend on
13 maintenance of cap integrity. If adequately installed and maintained, low permeability
14 cover systems have a history of effectively reducing surface infiltration to landfill
15 materials, promoting surface water drainage, minimizing erosion, and isolating landfill
16 materials from the environment.

17
18 A landfill cover system would not reduce potential future releases to groundwater from
19 wastes located in the saturated zone.

20
21 AOC 11. Removal of surface debris would provide long-term and effective protection
22 from existing physical hazards. The proposed action would not limit infiltration of
23 precipitation with the potential benefit of reducing contaminant leaching. Portions of the
24 landfill are subject to periodic flooding by the Nashua River which could expose expose
25 currently buried debris, possibly transport it to new locations, and present new exposure
26 hazards or pathways.

27
28 SA 12. Similar to the NFA Alternative, this alternative would not provide long-term
29 effectiveness at protecting human health or the environment.

30
31 SA 13. Similar to the NFA Alternative, this alternative would not provide long-term
32 effectiveness at protecting human health or the environment.
33

1 AOC 40. The long-term effectiveness of the low permeability cover system at controlling
2 potential future releases from the unsaturated zone of the landfill would depend on
3 maintenance of cap integrity. When adequately installed and maintained, low-permeability
4 cover systems have a history of effectively reducing surface infiltration to landfilled waste,
5 promoting surface water drainage, minimizing erosion, and isolating landfilled materials
6 from the environment.

7
8 Along the northeastern toe of the Cold Spring Brook Landfill, debris can be seen in
9 contact with water, and it is not known how much debris is in contact with groundwater
10 within the landfill. A landfill cover system would not reduce potential future releases from
11 the saturated zone. Consideration must be given during the design of the toe of the
12 landfill cover system to ensure that groundwater flow to the pond is not interrupted by
13 cover system layers. The long-term effectiveness of this alternative at preventing potential
14 human exposure also depends on enforcement of institutional controls and the long-term
15 groundwater monitoring program.

16
17 Excavation, removal, and disposal of hot spot sediments and drums from Cold Spring
18 Brook Pond and the landfill area would eliminate current risk to aquatic and semi-aquatic
19 receptors. Long-term sediment and biomonitoring programs would monitor potential
20 future releases to the pond.

21
22 AOC 41. Similar to the NFA Alternative, this alternative would not provide long-term
23 effectiveness at protecting human health or the environment.

24
25 **8.2.2.4 Reduction of Toxicity, Mobility, and Volume Through Treatment.** The
26 following paragraphs assess the reduction of toxicity, mobility, and volume of
27 contaminants through treatment offered by the proposed actions of Alternative 2.

28
29 SA 6. Similar to the NFA Alternative, there would be no reduction of toxicity, mobility,
30 or volume of contaminants through treatment. This alternative would not satisfy the
31 statutory preference for treatment as a component of remedial actions.

32
33 AOC 9. Reduction of toxicity, mobility, or volume of contaminants through treatment
34 would not be achieved. By reducing the potential for contaminant leaching in the

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1 unsaturated zone, the potential for contaminant migration to groundwater would be
2 reduced.

3
4 AOC 11. Reduction of toxicity, mobility, or volume of contaminants through treatment
5 would not be achieved. Removal of surface debris would reduce waste volume at
6 AOC 11; this volume would be transferred to another disposal site, however.

7
8 SA 12. Similar to the NFA Alternative, there would be no reduction of toxicity, mobility,
9 or volume of contaminants through treatment. This alternative would not satisfy the
10 statutory preference for treatment as a component of remedial actions.

11
12 SA 13. Similar to the NFA Alternative, there would be no reduction of toxicity, mobility,
13 or volume of contaminants through treatment. This alternative would not satisfy the
14 statutory preference for treatment as a component of remedial actions.

15
16 AOC 40. Reduction of toxicity, mobility, or volume of landfill contaminants through
17 treatment would not be achieved. By reducing the potential for leaching of landfill
18 materials in the unsaturated zone, the potential for contaminant migration to groundwater
19 would be reduced. No reduction of toxicity, mobility, or volume of groundwater
20 contaminants would be achieved. Sediment and drum removal would not reduce the
21 toxicity or volume of associated contaminants. Disposal of drums and dewatered
22 sediments under the low permeability cover at AOC 9 or at another approved disposal
23 facility would reduce contaminant mobility.

24
25 AOC 41. Similar to the NFA Alternative, there would be no reduction of toxicity,
26 mobility, or volume of contaminants through treatment. This alternative would not satisfy
27 the statutory preference for treatment as a component of remedial actions.

28
29 **8.2.2.5 Short-term Effectiveness.** The following paragraphs assess the short-term
30 effectiveness of the actions proposed at each of the landfills.

31
32 SA 6. Similar to the NFA Alternative, no action would be taken which would present
33 short-term risks to workers, the community, or the environment.

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1
2 AOC 9. This alternative would present minimal short-term risks to workers, the
3 community, and the environment. Risk to the community would be minimal because
4 residences are not close enough to the site to be impacted by noise or dust potentially
5 generated from cover system placement activities. It is anticipated that deliveries can be
6 planned to avoid creating traffic congestion and hazards.

7
8 RCRA and Department of Transportation (DOT) regulations affecting handling and
9 transportation of any potentially hazardous soils/sediments would reduce the risk of
10 community exposure to an uncontrolled release of hazardous materials.

11
12 Grading the landfill prior to capping could present potential risk to workers if hazardous
13 materials are uncovered. Exposure to potentially contaminated soil and debris could be
14 reduced to a safe level by worker adherence to general health and safety practices, and use
15 of personnel monitoring during any intrusive activities at the landfill.

16
17 AOC 11. This alternative would be expected to present minimal short-term risks to
18 workers, the community, and the environment. Risk to the community would be minimal
19 because residences are not close enough to the site to be impacted by noise or dust
20 potentially generated from debris removal activities. It is anticipated that debris removal
21 activities can be planned to avoid creating traffic congestion and hazards.

22
23 Grading the landfill prior to capping could present potential risk to workers if hazardous
24 materials are uncovered. Exposure to potentially contaminated soil and debris could be
25 reduced to a safe level by worker adherence to general health and safety practices, and use
26 of personnel monitoring during any intrusive activities at the landfill.

27
28 SA 12. Similar to the NFA Alternative, no action would be taken which would present
29 short-term risks to workers, the community, or the environment.

30
31 SA 13. Similar to the NFA Alternative, no action would be taken which would present
32 short-term risks to workers, the community, or the environment.

33
34 AOC 40. This alternative would present minimal short-term risks to workers and the
35 community, but would present some short-term risks to the environment. Risk to the

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1 community would be minimal because residences are not close enough to the site to be
2 impacted by noise or dust potentially generated from cover system placement activities.
3 Several routes and entry points to Devens exist, and it is anticipated that delivery of
4 construction materials can be planned to avoid creating traffic congestion and hazards. In
5 addition, rerouting of traffic on the section of Patton Road south of the Cold Spring
6 Brook Landfill would be evaluated. Inclusion of this section of the road and an area to the
7 south of Patton Road included in the exclusion zone used during cover system placement
8 and sediment and drum removal would facilitate remedial activities.

9
10 RCRA and DOT regulations affecting handling and transportation of any potentially
11 hazardous soils/sediments would reduce the risk of community exposure to an
12 uncontrolled release of hazardous materials.

13
14 Grading the landfill prior to capping could present potential risk to workers if hazardous
15 materials are uncovered. Exposure to potentially contaminated soil and debris could be
16 reduced to a safe level by worker adherence to general health and safety practices, and use
17 of personnel monitoring during any intrusive activities at the landfill.

18
19 Implementation of Alternative 2 will result in several short-term adverse effects to the
20 environment. The installation of the proposed cover system would require cutting and
21 clearing the established tree and grassed areas. This would temporarily displace current
22 biota and destroy their habitat. Reconstruction of the landfill slope leading down to Cold
23 Spring Brook Pond would require some excavation in the pond and possibly the
24 construction of a temporary access road along the edge of the pond. This and proposed
25 sediment removal activity would destroy existing wetland habitat. The vegetation of the
26 landfill cover and wetland restoration program would restore/replace these affected areas.

27
28 No endangered species or species of special concern are known to occur at Cold Spring
29 Brook Pond. However, silt fence or a floating boom weighted at the bottom and placed
30 around the areas of sediment excavation would minimize sediment contaminant migration
31 beyond the excavation boundaries. Wetland restoration in disturbed areas would mitigate
32 short-term impact and minimize long-term impact to the environment. Because the

1 disturbed areas would be relatively small compared to Cold Spring Brook Pond and
2 bordering wetland, adverse community effects, although possible, are unlikely.

3
4 AOC 41. Similar to the NFA Alternative, no action would be taken which would present
5 short-term risks to workers, the community, or the environment.

6
7 **8.2.2.6 Implementability.** The following paragraphs assess the implementability of the
8 actions proposed at each of the landfills.

9
10 SA 6. Similar to the NFA Alternative, this alternative is readily implementable at SA 6.

11
12 AOC 9. Placement of land use restrictions on property currently owned by the U.S. Army
13 would be easily implemented upon property transfer. The filing of a Record Notice of
14 Landfill Operation, in conformance with 310 CMR 19.141, is an easily implementable land
15 use restriction.

16
17 Cover system construction can be accomplished using standard construction procedures
18 and conventional earthmoving equipment. Many engineering and construction companies
19 are qualified to design and construct a landfill cover system. Materials required to
20 construct a low-permeability cover system are readily available. Post-closure monitoring
21 and maintenance are easily implementable. Installation of the cover system could increase
22 the scope of potential future remedial actions at the site, if these actions required access to
23 the debris.

24
25 According to the NCP, no federal, state, or local permits are required for on-site response
26 actions conducted pursuant to CERCLA, although coordination with review agencies is
27 recommended. Placement of the cover system would not require any permits, because it is
28 an on-site activity. During construction of the cover system, stormwater runoff would be
29 controlled to minimize erosion and potential surface water contamination.

30
31 Compliance with the post-closure long-term monitoring and maintenance requirements of
32 310 CMR 19.000 increases the administrative burden and complexity of this alternative
33 and makes implementation more difficult.

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1 AOC 11. Placement of zoning and deed restrictions on property currently owned by the
2 U.S. Army would be easily implemented in the event of property transfer. The filing of a
3 Record Notice of Landfill Operation, in conformance with 310 CMR 19.141, is an easily
4 implementable land use restriction.

5
6 Debris removal would not increase the scope of potential future remedial actions at the
7 site.

8
9 According to the NCP, no federal, state, or local permits are required for on-site response
10 actions conducted pursuant to CERCLA, although coordination with review agencies is
11 recommended. Debris removal would not require any permits, because it is an on-site
12 activity. During debris removal, stormwater runoff would be controlled to minimize
13 erosion and potential surface water contamination.

14
15 SA 12. Similar to the NFA Alternative, this alternative is readily implementable at SA 12.

16
17 SA 13 Similar to the NFA Alternative, this alternative is readily implementable at SA 13.

18
19 AOC 40. Placement of land use restrictions on property currently owned by the U.S.
20 Army would be easily implemented upon property transfer. The filing of a Record Notice
21 of Landfill Operation, in conformance with 310 CMR 19.141, is an easily implementable
22 land use restriction. Equipment required to excavate and handle sediment, remove and
23 handle 55-gallon drums and potentially construct a temporary access road at the Cold
24 Spring Brook Landfill is conventional in nature, and contractors are readily available.
25 Implementation of this alternative would not limit or interfere with the ability to perform
26 future remedial actions.

27
28 Discarded 55-gallon drums would be disposed of at AOC 9 or at an off-site TSD facility if
29 drum contents displayed hazardous characteristics. Sediment would require dewatering to
30 eliminate free water prior to disposal at AOC 9. Some sediments may exhibit hazardous
31 characteristics, and would require disposal at a licensed landfill or incinerator. Off-site
32 services should have sufficient capacity for the relatively small volume of sediments
33 requiring disposal.

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1
2 According to the NCP, no federal, state, or local permits are required for on-site response
3 actions conducted pursuant to CERCLA, although coordination with review agencies is
4 recommended. Because remedial actions for this alternative will be conducted on-site,
5 permits would not be required for sediment dredging or discharge of water from
6 dewatered sediment to Cold Spring Brook Pond. However, consultation with the local
7 conservation commission in accordance with Massachusetts Wetlands Protection
8 Regulations (310 CMR 10.000) may be required prior to constructing an access road at
9 the northwestern toe of the landfill. In addition, dredging of sediment in Cold Spring
10 Brook Pond will have to be done in accordance with the technical requirements of the
11 Massachusetts Waterways Act (MGL, c. 91; 310 CMR 9.00), and the Massachusetts
12 Water Quality Certification for Dredging (314 CMR 9.00).

13
14 Cover system construction can be accomplished using standard construction procedures
15 and conventional earthmoving equipment. Many engineering and construction companies
16 are qualified to design and construct a landfill cover system. Materials required to
17 construct a low-permeability cover system include approximately 14,200 cy of sand,
18 9,600 cy of common borrow, 7,100 cy of vegetative soil, 2,250 cy of riprap, and 192,000
19 sf of geomembrane, all of which are readily available. Post-closure monitoring and
20 maintenance are easily implementable.

21
22 Partial dewatering of the Cold Spring Brook Pond, and construction of a temporary access
23 road are implementable, but would require extra engineering precautions and time to
24 create a stable work platform and cover footing while minimizing impacts to the pond and
25 associated wetland. To stabilize the toe of the slope of the cover system, it would most
26 likely be necessary to excavate to stable sands beneath the sediment.

27
28 Installation of the cover system could increase the scope of potential future remedial
29 actions at the site, if these actions required access to the debris.

30
31 Placement of the cover system would not require any permits, because it is an on-site
32 activity. During construction of the cover system, stormwater runoff would be controlled
33 to minimize the quantity of sediments and contaminants entering the pond.
34

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1 Compliance with the post-closure long-term monitoring and maintenance requirements of
2 310 CMR 19.000 increases the administrative burden and complexity of this alternative
3 and makes implementation more difficult.

4
5 AOC 41. Similar to the NFA Alternative, this alternative is readily implementable at
6 AOC 41.

7
8 **8.2.2.7 Cost.** The cost estimate for Alternative 2 includes estimates of direct and indirect
9 capital costs and O&M costs. Direct capital costs for this alternative include site
10 preparation, debris and sediment excavation, drum removal, cap construction, site
11 restoration and monitoring wells installation. A 25 percent contingency is included in
12 direct cost items to account for unforeseen project complexities (e.g., adverse weather
13 conditions and inadequate site characterization).

14
15 O&M costs include landfill cover maintenance, and environmental monitoring for
16 groundwater, wetlands and sediment.

17
18 Table 8-5 summarizes the cost estimate for Alternative 2. The total capital cost (direct
19 plus indirect costs) is estimated to be \$6,633,000. O&M costs are estimated to be
20 \$89,000 per year.

21
22 To enable evaluation of costs that would occur over different time periods, the table also
23 includes a present worth analysis. Present worth represents the amount of money that, if
24 invested now and disbursed as needed, would be sufficient to cover all costs associated
25 with the remedial action over its planned life. A discount rate of 7 percent before taxes
26 and after inflation is used as recommended in USEPA's Office of Solid Waste and
27 Emergency Response (OSWER) Directive 9355.3-20. Unless noted otherwise, costs are
28 based on a 30-year time frame. Cost calculations are included in Appendix D.

8.3 ALTERNATIVE 3: NO FURTHER ACTION AT AOC 41, AND SAS 6, 12, AND 13; AND CAP-IN-PLACE AT AOCs 9, 11, AND 40

This subsection describes Alternative 3, evaluates the alternative using the seven evaluation criteria, and provides a cost estimate.

8.3.1 Description of Alternative 3

This alternative includes different types of management at the seven disposal sites. At AOC 41, and SAS 6, 12, and 13 NFA is taken. At AOCs 9, 11, and 40 a cap is placed over the debris. AOC 9 will have some consolidation of debris to minimize the size of the cap. Alternative 3 also includes removing exposed drums at AOC 40 to remove a potential source of contamination, and excavation of sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments. These actions at AOC 40 were described previously in the FS for AOC 40 (ABB-ES, 1994b).

Key components of Alternative 3 include:

No Further Action at AOC 41, SAS 6, 12, 13

- No action

Cap-in-Place AOCs 9, 11, 40

- Mobilization/demobilization;
- Site preparation;
- Sediment removal and disposal at AOC 40;
- Drum removal and disposal; at AOC 40;
- Consolidate debris areas at AOC 9;
- Cap construction;
- Site restoration;
- Wetland restoration;
- Institutional controls;
- Cover system monitoring and maintenance; and

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- Five-year site reviews.

8.3.1.1 Description of No Further Action Components for Alternative 3. The NFA is similar to that discussed for Alternative 1, Subsection 8.1.1.

8.3.1.2 Description of Cap-In-Place Components for Alternative 3.

Mobilization/demobilization. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Site Preparation. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Sediment removal and disposal at AOC 40. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Drum removal and disposal at AOC 40. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Consolidate debris areas at AOC 9. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Cap construction. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3. The cap for AOC 11 is similar to that described for AOC 9 and will include riprap for erosion control over the portion of the cap along the Nashua River. a plan view of AOC 11 is shown on Figure 8-6.

Site restoration. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Wetland restoration. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

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Institutional controls. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Cover system monitoring and maintenance. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Five-year site reviews. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

8.3.2 Detailed Evaluation of Alternative 3

The following subsections present an assessment of Alternative 3 according to the seven evaluation criteria.

8.3.2.1 Overall Protection of Human Health and the Environment. The following paragraphs assess how the proposed actions of this alternative would provide protection of human health and the environment.

SA 6. Overall protection of human health and the environment is similar to that discussed for the NFA Alternative in Subsection 8.1.2.1.

AOC 9. Overall protection of human health and the environment is similar to that discussed in Subsection 8.2.2.1.

AOC 11. Installation of a low permeability cover at AOC 11 would remove potential physical hazards to occasional site visitors, limit human and ecological exposure to surface soils, and reduce infiltration of precipitation which could potentially leach contaminants from landfill debris and contaminate groundwater. Implementation of a long-term groundwater monitoring program and five-year site review would provide a means to assess the affect of potential future releases of contaminants on groundwater.

SA 12. Similar to the NFA Alternative, this alternative would not provide protection of human health and the environment.

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1 SA 13. Similar to the NFA Alternative, this alternative would not provide protection of
2 human health and the environment.

3
4 AOC 40. Overall protection of human health and the environment is similar to that
5 discussed in Subsection 8.2.2.1.

6
7 AOC 41. Similar to the NFA Alternative, this alternative would not provide protection of
8 human health and the environment.

9
10 **8.3.2.2 Compliance with ARARs.** Tables 8-6, 8-7, and 8-8 summarize how
11 Alternative 3 will attain ARARs.

12
13 **8.3.2.3 Long-term Effectiveness and Permanence.** The following paragraphs assess
14 the long-term effectiveness and permanence of the proposed actions of this alternative.

15
16 SA 6. The long-term effectiveness and permanence of this alternative is similar to that
17 discussed in Subsection 8.1.1.3.

18
19 AOC 9. The long-term effectiveness and permanence of this alternative is similar to that
20 discussed in Subsection 8.2.2.3.

21
22 AOC 11. The long-term effectiveness of a low permeability landfill cover at controlling
23 potential future releases from the unsaturated zone beneath the landfill would depend on
24 the maintenance of cap integrity. When adequately installed and maintained, low
25 permeability cover systems have a history of effectively reducing surface infiltration to
26 landfill materials, promoting surface water drainage, minimizing erosion, and isolating
27 landfill materials from the environment. Portions of the low permeability cover would
28 likely be subject to periodic flooding by the Nashua River and could be washed away.

29
30 SA 12. Similar to the NFA Alternative, this alternative would not provide long-term
31 effectiveness at protecting human health or the environment.
32

1 SA 13. Similar to the NFA Alternative, this alternative would not provide long-term
2 effectiveness at protecting human health or the environment.

3
4 AOC 40. The long-term effectiveness and permanence of this alternative is similar to that
5 discussed in Subsection 8.2.2.3.

6
7 AOC 41. Similar to the NFA Alternative, this alternative would not provide long-term
8 effectiveness at protecting human health or the environment.

9
10 **8.3.2.4 Reduction of Toxicity, Mobility, and Volume Through Treatment.** The
11 following paragraphs assess the reduction of toxicity, mobility, and volume of
12 contaminants through treatment offered by the proposed actions of this alternative.

13
14 SA 6. Similar to the NFA Alternative, there would be no reduction of toxicity, mobility,
15 or volume of contaminants through treatment. This alternative would not satisfy the
16 statutory preference for treatment as a component of remedial actions.

17
18 AOC 9. The reduction in toxicity, mobility, and volume through treatment is similar to
19 that discussed in Subsection 8.2.2.4.

20
21 AOC 11. Reduction of toxicity, mobility, or volume of contaminants through treatment
22 would not be achieved. By reducing the potential for contaminant leaching in the
23 unsaturated zone, the potential for contaminant migration to groundwater would be
24 reduced.

25
26 SA 12. Similar to the NFA Alternative, there would be no reduction of toxicity, mobility,
27 or volume of contaminants through treatment. This alternative would not satisfy the
28 statutory preference for treatment as a component of remedial actions.

29
30 SA 13. Similar to the NFA Alternative, no reduction of toxicity, mobility, or volume of
31 contaminants would be achieved through treatment. This alternative would not satisfy the
32 statutory preference for treatment as a component of remedial actions.

33
34 AOC 40. The reduction in toxicity, mobility, and volume through treatment is similar to
35 that discussed in Subsection 8.2.2.4.

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1
2 AOC 41. Similar to the NFA Alternative, there would be no reduction of toxicity,
3 mobility, or volume of contaminants through treatment. This alternative would not satisfy
4 the statutory preference for treatment as a component of remedial actions.
5

6 **8.3.2.5 Short-term Effectiveness.** The following paragraphs assess the short-term
7 effectiveness of the actions proposed at each of the landfills.
8

9 SA 6. Similar to the NFA Alternative, no action would be taken which would present
10 short-term risks to workers, the community, or the environment.
11

12 AOC 9. The short-term effectiveness of this alternative is similar to that discussed in
13 Subsection 8.2.2.5.
14

15 AOC 11. This alternative would be expected to present minimal short-term risks to
16 workers, the community, and the environment. Risk to the community would be minimal
17 because residences are not close enough to the site to be impacted by noise or dust
18 potentially generated from cover system placement activities. It is anticipated that
19 deliveries can be planned to avoid creating traffic congestion and hazards.
20

21 Grading the landfill prior to capping could present potential risk to workers if hazardous
22 materials are uncovered. Exposure to potentially contaminated soil and debris could be
23 reduced to a safe level by worker adherence to general health and safety practices, and use
24 of personnel monitoring during any intrusive activities at the landfill.
25

26 SA 12. Similar to the NFA Alternative, no action would be taken which would present
27 short-term risks to workers, the community, or the environment.
28

29 SA 13. Similar to the NFA Alternative, no action would be taken which would present
30 short-term risks to workers, the community, or the environment.
31

32 AOC 40. The short-term effectiveness of this alternative is similar to that discussed in
33 Subsection 8.2.2.5.

1
2 AOC 41. Similar to the NFA Alternative, no action would be taken which would present
3 short-term risks to workers, the community, or the environment.
4

5 **8.3.2.6 Implementability.** The following paragraphs assess the implementability of the
6 actions proposed at each of the landfills.
7

8 SA 6. Similar to the NFA Alternative, this alternative is readily implementable at SA 6.
9

10 AOC 9. The implementability of this alternative is similar to that discussed in
11 Subsection 8.2.2.6.
12

13 AOC 11. Placement of land use restrictions on property currently owned by the U.S.
14 Army would be easily implemented upon property transfer. The filing of a Record Notice
15 of Landfill Operation, in conformance with 310 CMR 19.141, is an easily implementable
16 land use restriction.
17

18 Cover system construction can be accomplished using standard construction procedures
19 and conventional earthmoving equipment. Many engineering and construction companies
20 are qualified to design and construct a landfill cover system. Materials required to
21 construct a low-permeability cover system are readily available. Post-closure monitoring
22 and maintenance are easily implementable. Installation of the cover system could increase
23 the scope of potential future remedial actions at the site, if these actions required access to
24 the debris.
25

26 According to the NCP, no federal, state, or local permits are required for on-site response
27 actions conducted pursuant to CERCLA, although coordination with review agencies is
28 recommended. Placement of the cover system would not require any permits, because it is
29 an on-site activity. During construction of the cover system, stormwater runoff would be
30 controlled to minimize erosion and potential surface water contamination.
31

32 Compliance with the post-closure long-term monitoring and maintenance requirements of
33 310 CMR 19.000 increases the administrative burden and complexity of this alternative
34 and makes implementation more difficult.
35

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1 SA 12. Similar to the NFA Alternative, this alternative is readily implementable at SA 12.

2
3 SA 13. Similar to the NFA Alternative, this alternative is readily implementable at SA 13.

4
5 AOC 40. The implementability of this alternative is similar to that discussed in
6 Subsection 8.2.2.6.

7
8 AOC 41. Similar to the NFA Alternative, this alternative is readily implementable at AOC
9 41.

10
11 **8.3.2.7 Cost.** The cost estimate for Alternative 3 includes estimates of direct and indirect
12 capital costs and O&M costs. Direct capital costs included for this alternative include site
13 preparation, sediment and debris excavation, drum removal, cap construction, site
14 restoration and monitoring well installation. A 25 percent contingency is included in
15 direct cost items to account for unforeseen project complexities (e.g., adverse weather
16 conditions and inadequate site characterization).

17
18 O&M costs include landfill cover maintenance, and environmental monitoring of
19 groundwater, wetlands and sediment.

20
21 Table 8-9 summarizes the cost estimate for Alternative 3. The total capital cost (direct
22 plus indirect costs) is estimated to be \$8,226,000. O&M costs are estimated to be
23 \$112,000 per year.

24
25 To enable evaluation of costs that would occur over different time periods, the table also
26 includes a present worth analysis. Present worth represents the amount of money that, if
27 invested now and disbursed as needed, would be sufficient to cover all costs associated
28 with the remedial action over its planned life. A discount rate of 7 percent before taxes
29 and after inflation is used as recommended in USEPA's OSWER Directive 9355.3-20.
30 Unless noted otherwise, costs are based on a 30-year time frame. The estimated total
31 present worth is \$9,507,000. Cost calculations are included in Appendix D.
32
33

**8.4 ALTERNATIVE 4: NO FURTHER ACTION AT AOC 41, AND SAs 6, 12, AND 13;
LIMITED REMOVAL AT AOC 11 (DISPOSAL IN CONSOLIDATION LANDFILL);
AND EXCAVATION AND CONSOLIDATION OF AOCs 9 AND 40**

8.4.1 Description of Alternative 4

Alternative 4 proposes removal of surface debris from AOC 11, excavating construction/demolition debris from AOC 9 and AOC 40, and consolidating the debris in a proposed secure landfill near Shepley's Hill Landfill. Based on available information, these areas contain non-hazardous debris only. The AOCs will be treated as construction debris landfills.

Alternative 4 also includes removing exposed drums at Cold Spring Brook Landfill (AOC 40) to remove a potential source of contamination, and excavating sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments. These actions were described previously in the FS for AOC 40 (ABB-ES, 1994b).

The key components of Alternative 4 include:

No Further Action at AOC 41, SAs 6, 12, 13

- No action

Limited Removal at AOC 11

- Mobilization/demobilization;
- Excavation of debris and transportation to the Consolidation Landfill;
- Backfilling site; and
- Site restoration.

Excavation and Consolidation of AOCs 9 and 40

- Mobilization/demobilization;
- AOC 40 sediment removal and disposal;

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- AOC 40 drum removal and disposal;
- Debris excavation and backfill at AOCs 9 and 40;
- Wetlands restoration;
- Consolidation of excavated debris at consolidation landfill;
- Institutional controls;
- Cover system monitoring and maintenance at consolidation landfill; and
- Five-year site reviews;

8.4.1.1 Description of No Further Action Components for Alternative 4. NFA is similar to that discussed for Alternative 1, Subsection 8.1.1.

8.4.1.2 Description of Limited Removal Components for Alternative 4.

Mobilization/demobilization. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Excavation of debris and transportation to the Consolidated Landfill. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Backfilling site. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Site restoration. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

8.4.1.3 Description of Excavate and Consolidate AOC 9 and AOC 40 Components for Alternative 4.

Mobilization/demobilization. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

1 Site Preparation. This component is similar to that discussed in Alternative 2,
2 Subsection 8.2.1.3.

3
4 Sediment Removal and Disposal at AOC 40. This component is similar to that discussed
5 in Alternative 2, Subsection 8.2.1.3.

6
7 Drum Removal and Disposal at AOC 40. This component is similar to that discussed in
8 Alternative 2, Subsection 8.2.1.3.

9
10 Debris Excavation and Backfill at AOCs 9 and 40. A total debris volume of
11 approximately 222,000 cy will be generated by excavation from AOC 9 (112,000 cy) and
12 AOC 40 (110,000 cy). The basis of the debris volumes is presented in Appendix B.

13
14 As presented in Section 1, the estimated volumes are based primarily on observations
15 during test pit/trench excavations. Debris will be removed with excavators with the
16 possible necessity of specialized equipment for AOC 40, due to the steep slopes at these
17 areas. Erosion control measures will be used at all excavations, especially those adjacent
18 to wetlands, to prevent impacts to surrounding areas. These measures may include silt
19 fences, hay bales, and polystyrene covers for soil piles left on-site during excavation.

20
21 Subsequent to debris removal, the excavation at AOC 9 will be backfilled to correspond to
22 existing topography which existed prior to removal. AOC 40 will be backfilled to match a
23 2:1 slope from Patton Road down to Cold Spring Brook Pond. The required backfill will
24 be from an off-site borrow source.

25
26 Wetlands Restoration. This component is similar to that discussed in Alternative 2,
27 Subsection 8.2.1.3.

28
29 Consolidation of Excavated Debris at Consolidation Landfill. The preferred site for the
30 Consolidation Landfill is an open, sandy borrow area east of Shepley's Hill Landfill (see
31 Figure 8-8). The site covers approximately 12 acres, bounded on the north by Plow Shop
32 Pond, on the west and south by Shepley's Hill Landfill, and on the east by the Army
33 reservation boundary.

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1 This area was selected because of its large size and favorable location in an area that
2 would have minimal impact on human health. The area is not visible from main roads or
3 public areas, so it would not adversely impact the aesthetic value of the surrounding
4 property. The Shepley's Hill Landfill site is accessible off Carey Street on the Main Post.
5 However, access to the site would need to be significantly improved for truck traffic,
6 because the current access road is narrow and unpaved. Utilities are not available on site.
7 A drainage swale from the existing landfill crosses the site and would require rerouting
8 and culvert installations to permit facility construction.

9
10 Hydrogeology at the Shepley's Hill area has been studied extensively, and much
11 information has been documented in previous reports. A compilation of this data is
12 provided in Appendix E consistent with the requirements for a Hydrogeological Study
13 derived in the Massachusetts Solid Waste Regulation (310 CMR 19.104.(3)).

14
15 The Consolidation Landfill would be constructed near Shepley's Hill Landfill to
16 accommodate debris from the disposal areas at Devens. Design for construction,
17 operation, and closure of the landfill would be carried out in accordance with the
18 Massachusetts Solid Waste Management Facility Regulations 310 CMR 19.000 Parts I
19 and II. This alternative assumes that the Consolidation Landfill would be constructed
20 prior to excavation at the debris areas.

21
22 The conceptual design for the Consolidation Landfill complies with the requirements of
23 310 CMR 19.110 and 19.112. If this alternative is selected, alternative design components
24 and methodologies to improve performance and/or reduce costs should be evaluated
25 during the design phase.

26
27 The cost estimate for this alternative, presented in Appendix D, is based on construction
28 of an approximately 7-acre landfill with enough capacity for the estimated 222,000 cy of
29 debris from AOCs 9 and 40. For estimating purposes, the daily cover was estimated to be
30 10 percent of the total volume to be landfilled and the final cover would be 5 ft thick. The
31 estimated volume would be approximately 304,000 cy.

1 The conceptual Consolidation Landfill used for cost estimating is, approximately 550 ft by
2 550 ft, and has three-horizontal to one-vertical side slopes maximum, 5 percent top slope
3 minimum, and 2 percent bottom slope. The landfill height would be approximately 50 ft
4 above existing grade. Figures 8-9 and 8-10 show the plan and cross-sectional views of the
5 Consolidation Landfill, respectively. The basis for the Consolidation Landfill footprint and
6 elevations is presented in Appendix B. A geotechnical evaluation was made for
7 settlement, slope stability under static and seismic conditions, and for geosynthetic-soil
8 interface stability. The geotechnical evaluation is presented in Appendix F.

9
10 The conceptual Consolidation Landfill includes a groundwater protection system to:
11 (1) provide an effective hydraulic barrier preventing leachate from reaching groundwater,
12 and (2) to collect landfill leachate for disposal. The groundwater protection system would
13 consist of a composite hydraulic barrier layer (low permeable soil layer and
14 geomembrane), a drainage layer with leachate collection pipes, a buffer soil layer, and a
15 geotextile fabric. The purpose of the fabric is to prevent clogging of the leachate
16 collection soil layers caused by potential migration of fine particles contained within the
17 landfilled debris. The composite hydraulic barrier would consist of 24 inches of
18 compacted soil with a maximum in-place saturated hydraulic conductivity of
19 1×10^{-7} cm/sec, overlain by a 60-mil geomembrane (Figure 8-11). A 12-inch sand drainage
20 layer is proposed above the geomembrane. The drainage layer would have a minimum
21 hydraulic conductivity of 1×10^{-2} cm/sec with leachate collection pipes spaced 50 ft on
22 center. The sand drainage layer and the leachate collection pipes would provide a high
23 permeability pathway for leachate collection. The 12-inch buffer soil layer above the sand
24 layer would have a minimum hydraulic conductivity of 1×10^{-3} cm/sec. Leachate collected
25 in the landfill could be removed by pumping the leachate directly from the leachate
26 collection system into tanker trucks for transport to an approved wastewater treatment
27 facility for disposal.

28
29 When debris disposal is complete, the landfill will be closed and a low-permeability cover
30 system constructed. Figure 8-11 shows the groundwater protection and cover system
31 build-up used for cost estimating. A 12-inch minimum subgrade buffer soil will be placed
32 over the debris to prevent penetration of the overlying geomembrane. A 12-inch sand
33 drainage layer with a minimum hydraulic conductivity of 1×10^{-3} cm/sec would overlay the
34 geomembrane. An 18-inch common borrow soil with 15-35 percent fines would overlay
35 the drainage soil for moisture retention and protection of the geomembrane against

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1 heaving from frost. A geotextile fabric would separate the moisture retention soil layer
2 from the drainage soil layer. The vegetative topsoil layer would be approximately 6 inches
3 cover thick and the moisture retention soil.

4
5 Institutional Controls. This component is similar to that discussed in Alternative 2,
6 Subsection 8.2.1.3.

7
8 Cover System Monitoring and Maintenance at Consolidation Landfill. This component is
9 similar to that discussed in Alternative 2, Subsection 8.2.1.3.

10
11 Five-year Site Reviews. This component is similar to that discussed in Alternative 2,
12 Subsection 8.2.1.3.

13 14 **8.4.2 Detailed Evaluation of Alternative 4**

15
16 The following subsections present an assessment of Alternative 4 according to the seven
17 evaluation criteria.

18
19 **8.4.2.1 Overall Protection of Human Health and the Environment.** The following
20 paragraphs assess how the proposed actions of this alternative would provide protection
21 of human health and the environment.

22
23 SA 6. Overall protection of human health and the environment is similar to that discussed
24 for the NFA Alternative in Subsection 8.1.2.1.

25
26 AOC 9. This alternative would provide protection of human health and the environment
27 by excavating landfill materials and then disposing of them at the consolidation facility.
28 This would prevent potential future exposure to surface soil and sediment and would
29 prevent potential future releases from landfill debris to groundwater. However, moving
30 the landfill debris to a separate consolidation facility would transfer the risk of potential
31 releases to another location. Because the PRE did not identify significant potential for
32 human or ecological exposure risk at AOC 9, the risk reduction benefit from excavating
33 and consolidating AOC 9 is considered low.

AOC 11. Similar to Alternative 2, removal and disposal of surface debris would remove potential physical hazards to occasional site visitors and reduce human and terrestrial receptor exposure to surface soil, thereby reducing potential risk. This alternative differs from Alternative 2 in that removed surface debris would be disposed of at the consolidation facility rather than under a low permeability cover at AOC 9. Because the consolidation facility would be lined, disposal at the consolidation facility is theoretically more protective. However, because potential human health risks at AOC 11 were within or below the USEPA target values, the human health risk reduction benefit is considered low. No actions would be included to reduce or monitor potential ecological risk from exposure to wetland soil/sediment or surface water.

SA 12. Similar to the NFA Alternative, this alternative would not provide protection of human health and the environment.

SA 13. Similar to the NFA Alternative, this alternative would not provide protection of human health and the environment.

AOC 40. This alternative has significant potential for achieving an acceptable level of risk for human and ecological receptors. The drum and sediment removal components of this alternative would provide the same protectiveness as in Alternative 2; however, this alternative would prevent potential future releases from landfill debris to groundwater and Cold Spring Brook Pond sediment by excavating the soil and debris from the Cold Spring Brook Landfill, and disposing it in the Consolidation Landfill. However, moving the landfill debris to a separate consolidation facility would transfer the risk of potential releases to another location.

AOC 41. Similar to the NFA Alternative, this alternative would not provide protection of human health and the environment.

8.4.2.2 Compliance with ARARs. Tables 8-10, 8-11, and 8-12 summarize how Alternative 4 will attain ARARs.

8.4.2.3 Long-term Effectiveness and Permanence. The following paragraphs assess the long-term effectiveness and permanence of the proposed actions of this alternative.

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1
2 SA 6. The long-term effectiveness of this alternative is similar to that discussed for the
3 NFA Alternative in Subsection 8.1.2.3.

4
5 AOC 9. Excavation of landfill debris would effectively prevent human and ecological
6 exposure and would prevent the landfill from being a potential source of future
7 groundwater contamination. The effectiveness of the consolidation facility at isolating
8 landfill debris would depend on the quality of construction and proper maintenance of
9 cover and leachate collection systems. Landfills that include groundwater protection
10 systems with leachate collection, cover systems, and long-term monitoring and
11 maintenance have a history of effectively isolating wastes from the environment.

12
13 AOC 11. The long-term effectiveness of this alternative is similar to that discussed in
14 Subsection 8.2.2.3.

15
16 SA 12. Similar to the NFA Alternative, this alternative would not provide long-term
17 effectiveness at protecting human health or the environment.

18
19 SA 13. Similar to the NFA Alternative, this alternative would not provide long-term
20 effectiveness at protecting human health or the environment.

21
22 AOC 40. Removal of the landfill as a potential source of future groundwater
23 contamination, and removal of hot spot sediments and drums would effectively prevent
24 human and ecological exposure. The effectiveness of the consolidation facility at isolating
25 Cold Spring Brook Landfill debris would depend on the quality of construction and proper
26 maintenance of cover and leachate collection systems. Landfills that include groundwater
27 protection systems with leachate collection, cover systems, and long-term monitoring and
28 maintenance have a history of effectively isolating wastes from the environment.

29
30 AOC 41. Similar to the NFA Alternative, this alternative would not provide long-term
31 effectiveness at protecting human health or the environment.
32

1 **8.4.2.4 Reduction of Toxicity, Mobility, and Volume Through Treatment.** The
2 following paragraphs assess the reduction of toxicity, mobility, and volume of
3 contaminants through treatment offered by the proposed actions of this alternative.

4
5 SA 6. Similar to the NFA Alternative, there would be no reduction of toxicity, mobility,
6 or volume of contaminants through treatment. This alternative would not satisfy the
7 statutory preference for treatment as a component of remedial actions.

8
9 AOC 9. Reduction of toxicity, mobility, or volume of landfill contaminants through
10 treatment would not be achieved. By removing landfill debris, the potential for leaching of
11 landfill materials and contamination of groundwater would be reduced. No reduction of
12 toxicity, mobility, or volume of groundwater contaminants would be achieved. Disposal
13 of excavated landfill debris at a consolidation facility with low permeability liner, leachate
14 collection, and low permeability cover would reduce contaminant mobility.

15
16 AOC 11. The reduction in toxicity, mobility, and volume would be similar to that
17 discussed in Subsection 8.2.2.4.

18
19 SA 12. Similar to the NFA Alternative, there would be no reduction of toxicity, mobility,
20 or volume of contaminants through treatment. This alternative would not satisfy the
21 statutory preference for treatment as a component of remedial actions.

22
23 SA 13. Similar to the NFA Alternative, there would be no reduction of toxicity, mobility,
24 or volume of contaminants through treatment. This alternative would not satisfy the
25 statutory preference for treatment as a component of remedial actions.

26
27 AOC 40. Reduction of toxicity, mobility, or volume of landfill contaminants through
28 treatment would not be achieved. By removing landfill debris, the potential for leaching of
29 landfill materials and contamination of groundwater would be reduced. No reduction of
30 toxicity, mobility, or volume of groundwater contaminants would be achieved. Sediment
31 and drum removal would not reduce the toxicity or volume of associated contaminants.
32 Disposal of excavated landfill debris, drums, and dewatered sediments at a consolidation
33 facility with low permeability liner, leachate collection, and low permeability cover would
34 reduce contaminant mobility.

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1 AOC 41. Similar to the NFA Alternative, there would be no reduction of toxicity,
2 mobility, or volume of contaminants through treatment. This alternative would not satisfy
3 the statutory preference for treatment as a component of remedial actions.

4
5 **8.4.2.5 Short-term Effectiveness.** The following paragraphs assess the short-term
6 effectiveness of the actions proposed at each of the landfills.

7
8 SA 6. Similar to the NFA Alternative, no action would be taken which would present
9 short-term risks to workers, the community, or the environment.

10
11 AOC 9. This alternative is expected to present minimal risks to workers, the community,
12 and the environment. Transportation of excavated materials would be planned to avoid
13 creating traffic congestion and hazards to the community. Handling and transportation of
14 any hazardous materials would be conducted according to RCRA and DOT regulations to
15 protect workers and the community.

16
17 Available information does not suggest the presence of hazardous substances which would
18 present a risk to workers during excavation. Worker adherence to general health and
19 safety practices, and use of personnel monitoring would reduce potential exposure to
20 potentially hazardous substances to a safe level. Excavation of landfilled debris and
21 construction of the consolidation facility could generate dust. Dust suppression
22 techniques would reduce potential risk to workers and the community.

23
24 AOC 11. The short-term risks associated are the same as discussed for Alternative 2 in
25 Subsection 8.2.2.5. This alternative differs from Alternative 2 in that removed surface
26 debris would be disposed of at the consolidation facility. This would be expected to
27 present minimal short-term risks, and the overall short-term risk associated with this
28 alternative at AOC 11 would be expected to be minimal.

29
30 SA 12. Similar to the NFA Alternative, no action would be taken which would present
31 short-term risks to workers, the community, or the environment.

1 SA 13. Similar to the NFA Alternative, no action would be taken which would present
2 short-term risks to workers, the community, or the environment.

3
4 AOC 40. This alternative is expected to present minimal risks to workers, the community,
5 and the environment. Transportation of excavated materials would be planned to avoid
6 creating traffic congestion and hazards to the community. To further protect the
7 community, traffic on Patton Road could be rerouted during removal of soil and debris
8 from the Cold Spring Brook Landfill. Handling and transportation of any hazardous
9 materials would be conducted according to RCRA and DOT regulations to protect
10 workers and the community.

11
12 Available information does not suggest the presence of hazardous substances that would
13 present a risk to workers during excavation. Worker adherence to general health and
14 safety practices, and use of personnel monitoring would reduce potential exposure to
15 potentially hazardous substances to a safe level. Excavation of landfilled debris and
16 construction of the consolidation facility could generate dust. Dust suppression
17 techniques would reduce potential risk to workers and the community.

18
19 Excavation activities at the Cold Spring Brook Landfill would be conducted to minimize
20 adverse affects on the environment. Excavation would be conducted to minimize pond
21 water entering the excavation. In addition, stormwater runoff and groundwater flow into
22 the excavation would be controlled to minimize the quantity of sediment and contaminants
23 entering the pond. Construction of the temporary access road along the northwest toe of
24 the landfill may adversely affect the environment, but wetland restoration activities would
25 minimize any permanent effect. The consolidation facility would be located and
26 constructed according to regulations to minimize adverse affects on the environment.

27
28 AOC 41. Similar to the NFA Alternative, no action would be taken which would present
29 short-term risks to workers, the community, or the environment.

30
31 **8.4.2.6 Implementability.** The following paragraphs assess the implementability of the
32 actions proposed at each of the landfills.

33
34 SA 6. Similar to the NFA Alternative, this alternative is readily implementable at SA 6.
35

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1 AOC 9. Landfill excavation and construction can be accomplished using standard
2 construction procedures and conventional earthmoving equipment, and many engineering
3 and construction companies are qualified and available. Successful implementation of this
4 alternative is contingent on the approval and construction of a consolidation facility to
5 accept the excavated debris. The consolidation facility would be constructed and
6 maintained to effectively isolate debris excavated from AOC 9. Implementation of this
7 alternative would not limit or interfere with the ability to perform future remedial actions
8 at AOC 9.

9
10 All activities to excavate AOC 9 would be conducted on-site, and permits would not be
11 required. Design, construction, operation, closure, and post-closure monitoring and
12 maintenance of the consolidation facility would be conducted according to the technical
13 requirements of Massachusetts 310 CMR 19.000.

14
15 Consolidation of this disposal area with others reduce the administrative burden and
16 complexity of implementing the long-term monitoring and maintenance requirements of
17 310 CMR 19.000 at separate disposal areas.

18
19 AOC 11. Similar to Alternative 2 discussed in Subsection 8.2.2.6, this alternative is
20 readily implementable.

21
22 SA 12. Similar to the NFA Alternative, this alternative is readily implementable at SA 6.

23
24 SA 13. Similar to the NFA Alternative, this alternative is readily implementable at SA 6.

25
26 AOC 40. The implementability of sediment and drum removal, and installation and
27 monitoring of groundwater monitoring wells, is similar to that discussed for Alternative 2
28 in Subsection 8.2.2.6.

29
30 Landfill excavation and construction can be accomplished using standard construction
31 procedures and conventional earthmoving equipment, and many engineering and
32 construction companies are qualified and available. Successful implementation of this
33 alternative is contingent on the approval and construction of a consolidation facility to

1 accept the excavated debris. The consolidation facility would be constructed and
2 maintained to effectively isolate Cold Spring Brook Landfill debris. Implementation of
3 this alternative would not limit or interfere with the ability to perform future remedial
4 actions at Cold Spring Brook Landfill.

5
6 All activities to excavate Cold Spring Brook Landfill for this alternative would be
7 conducted on-site, and permits would not be required. At the Cold Spring Brook Landfill,
8 stormwater runoff would be controlled to minimize the quantity of sediments and
9 contaminants entering the pond. Design, construction, operation, closure, and post-
10 closure monitoring and maintenance of the consolidation facility would be conducted
11 according to the technical requirements of Massachusetts 310 CMR 19.000.

12
13 Consolidation of this disposal area with others reduce the administrative burden and
14 complexity of implementing the long-term monitoring and maintenance requirements of
15 310 CMR 19.000 at separate disposal areas.

16
17 AOC 41. Similar to the NFA Alternative, this alternative is readily implementable at SA 6.

18
19 **8.4.2.7 Cost.** The cost estimate for Alternative 4 includes estimates of direct and indirect
20 capital costs and O&M costs. Direct capital costs included for this alternative include site
21 preparation, sediment and debris excavation, drum removal, cap construction, site
22 restoration and monitoring well installation. A 25 percent contingency is included in
23 direct cost items to account for unforeseen project complexities (e.g., adverse weather
24 conditions and inadequate site characterization).

25
26 O&M costs include landfill cover maintenance, and environmental monitoring of
27 groundwater, wetlands, and sediment.

28
29 Table 8-13 summarizes the cost estimate for Alternative 5. The total capital cost (direct
30 plus indirect costs) is estimated to be \$16,235,000. O&M costs are estimated to be
31 \$56,000 per year.

32
33 To enable evaluation costs that would occur over different time periods, the table also
34 includes a present worth analysis. Present worth represents the amount of money that, if
35 invested now and disbursed as needed, would be sufficient to cover all costs associated

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with the remedial action over its planned life. A discount rate of 7 percent before taxes and after inflation is used as recommended in OSWER Directive 9355.3-20. Unless noted otherwise, costs are based on a 30-year time frame. The estimated total present worth is \$16,646,000. Cost calculations are included in Appendix D.

8.5 ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11 (DISPOSAL IN CONSOLIDATION LANDFILL); CAP-IN-PLACE AT AOC 41 AND SAS 6, 12, AND 13; AND EXCAVATION AND CONSOLIDATION OF AOCs 9 AND 40

This subsection describes Alternative 5, evaluates the alternative using the seven evaluation criteria, and provides a cost estimate.

8.5.1 Description Of Alternative 5

Alternative 5 proposes limited removal of debris from AOC 11; capping AOC 41, SAS 6, 12, 13; excavating construction/demolition debris from AOCs 9 and 40; and consolidating the excavated debris in a proposed secure landfill near Shepley's Hill Landfill. Based on available information, these areas contain non-hazardous debris only. The SA/AOCs will be treated as construction debris landfills.

Alternative 5 also includes removing exposed drums at Cold Spring Brook Landfill (AOC 40) to remove a potential source of contamination, and excavating sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments. These actions were described previously in the FS for AOC 40 (ABB-ES, 1994b).

The key components of Alternative 5 include:

Limited Removal at AOC 11

- Mobilization/demobilization;
- Excavation of debris and transportation to the Consolidation Landfill;

- Backfilling site; and
- Site restoration.

Cap-in-Place AOC 41, SAs 6, 12, 13

- Mobilization/demobilization;
- Site preparation;
- UXO Monitoring at SAs 6, 12, and AOC 41;
- Cap construction;
- Site restoration;
- Wetland restoration;
- Institutional controls;
- Cover system monitoring and maintenance; and
- Five-year site reviews.

Excavation and Consolidation at AOC 9 and AOC 40

- Mobilization/demobilization;
- AOC 40 sediment removal and disposal;
- AOC 40 drum removal and disposal;
- Debris excavation and backfill at AOCs 9 and 40;
- Wetlands restoration;
- Consolidation of excavated debris at Consolidation Landfill;
- Institutional controls;
- Cover system monitoring and maintenance at Consolidation Landfill; and
- Five-year site reviews;

8.5.1.1 Description of Limited Removal Components for Alternative 5.

Mobilization/demobilization. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Excavation of debris and transportation to the Consolidated Landfill. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

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1
2 Backfilling site. This component is similar to that discussed in Alternative 2,
3 Subsection 8.2.1.3.

4
5 Site restoration. This component is similar to that discussed in Alternative 2,
6 Subsection 8.2.1.3.

7 8 **8.5.1.2 Description of Cap-In-Place Components for Alternative 5.**

9
10 Mobilization/demobilization. This component is similar to that discussed in Alternative 2,
11 Subsection 8.2.1.3.

12
13 Site Preparation. This component is similar to that discussed in Alternative 2,
14 Subsection 8.2.1.3.

15
16 UXO Monitoring at SAs 6, 12 and AOC 41. UXO monitoring by professionals trained
17 and experienced in this work is included during excavation at the SAs 6, 12 and AOC 41
18 debris areas. Indications of spent ordnance (e.g. .45 ACP Ammunition Can and Crate,
19 40mm Grenade Bandoleer Cups, MK 2 Grenade Fuses, M 14 Stripper Clips) were found
20 during the 1994 test trench investigation at SA 12. SA 12 was used as a Range Control
21 Landfill, and it is uncertain whether other debris areas may contain ordnance. UXO
22 clearance and monitoring would be the responsibility of the remediation contractor.

23
24 Cap construction. This component is similar to that discussed in Alternative 2,
25 Subsection 8.2.1.3. Plan views of AOC 41, SAs 6, 12 and 13 are shown on Figures 8-12
26 through 8-18.

27
28 Site restoration. This component is similar to that discussed in Alternative 2,
29 Subsection 8.2.1.3.

30
31 Wetland restoration. This component is similar to that discussed in Alternative 2,
32 Subsection 8.2.1.3.

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1 Institutional controls. This component is similar to that discussed in Alternative 2,
2 Subsection 8.2.1.3.

3
4 Cover system monitoring and maintenance. This component is similar to that discussed in
5 Alternative 2, Subsection 8.2.1.3.

6
7 Five-year site reviews. This component is similar to that discussed in Alternative 2,
8 Subsection 8.2.1.3.

9
10 **8.5.1.3 Description of Excavate and Consolidate AOC 9 and AOC 40 Components**
11 **for Alternative 5.**

12
13 Mobilization/demobilization. This component is similar to that discussed in Alternative 2,
14 Subsection 8.2.1.3.

15
16 Site preparation. This component is similar to that discussed in Alternative 2,
17 Subsection 8.2.1.3.

18
19 Sediment removal and disposal at AOC 40. This component is similar to that discussed in
20 Alternative 2, Subsection 8.2.1.3.

21
22 Drum removal and disposal at AOC 40. This component is similar to that discussed in
23 Alternative 2, Subsection 8.2.1.3.

24
25 Debris excavation and backfill at AOCs 9 and 40. This component is similar to that
26 discussed in Alternative 4, Subsection 8.4.1.3.

27
28 Wetlands restoration. This component is similar to that discussed in Alternative 2,
29 Subsection 8.2.1.3.

30
31 Consolidation of excavated debris at Consolidation Landfill. This component is similar to
32 that discussed in Alternative 4, Subsection 8.4.1.3.

33
34 Institutional controls. This component is similar to that discussed in Alternative 2,
35 Subsection 8.2.1.3.

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1
2 Cover system monitoring and maintenance at Consolidation Landfill. This component is
3 similar to that discussed in Alternative 4, Subsection 8.4.1.3.

4
5 Five-year site reviews. This component is similar to that discussed in Alternative 2,
6 Subsection 8.2.1.3.

7 8 **8.5.2 Detailed Evaluation of Alternative 5**

9
10 The following subsections present an assessment of Alternative 5 according to the seven
11 evaluation criteria.

12
13 **8.5.2.1 Overall Protection of Human Health and the Environment.** The following
14 paragraphs assess how the proposed actions of this alternative would provide protection
15 of human health and the environment.

16
17 SA 6. Installation of a low permeability cover at SA 6 would remove potential physical
18 hazards to occasional site visitors, limit human and ecological exposure to surface soils,
19 and reduce infiltration of precipitation which could potentially leach contaminants from
20 landfill debris and contaminate groundwater. Implementation of a long-term groundwater
21 monitoring program and five-year site review would provide a means to assess the affect
22 of potential future releases of contaminants on groundwater. These actions would provide
23 protection of human health and the environment. However, although potential human
24 health and environmental risks at SA 6 have not been evaluated in a PRE or baseline risk
25 assessment, they are considered minimal. Therefore, this alternative is considered to
26 provide little increased protection from the NFA Alternative, and the risk reduction benefit
27 from capping SA 6 is considered low.

28
29 AOC 9. Overall protection of human health and the environment is similar to that
30 discussed in Subsection 8.4.2.1.

31
32 AOC 11. Overall protection of human health and the environment is similar to that
33 discussed in Subsection 8.4.2.1.

SA 12. Installation of a low permeability cover at SA 12 would remove potential physical hazards to occasional site visitors, limit human and ecological exposure to surface soils, and reduce infiltration of precipitation which could potentially leach contaminants from landfill debris and contaminate groundwater. Implementation of a long-term groundwater monitoring program and five-year site review would provide a means to assess the affect of potential future releases of contaminants on groundwater. These actions would provide protection of human health and the environment.

SA 13. Installation of a low permeability cover at SA 13 would remove potential physical hazards to occasional site visitors, limit human and ecological exposure to surface soils, and reduce infiltration of precipitation, which could potentially leach contaminants from landfill debris and contaminate groundwater. Implementation of a long-term groundwater monitoring program and five-year site review would provide a means to assess the affect of potential future releases of contaminants on groundwater. These actions would provide protection of human health and the environment.

AOC 40. Overall protection of human health and the environment is similar to that discussed in Subsection 8.4.2.1.

AOC 41. Installation of a low permeability cover at AOC 41 would remove potential physical hazards to occasional site visitors, limit human and ecological exposure to surface soils, and reduce infiltration of precipitation which could potentially leach contaminants from landfill debris and contaminate groundwater. Implementation of a long-term groundwater monitoring program and five-year site review would provide a means to assess the affect of potential future releases of contaminants on groundwater. These actions would provide protection of human health and the environment.

8.5.2.2 Compliance with ARARs. Tables 8-14, 8-15, and 8-16 summarize how Alternative 5 will attain ARARs.

8.5.2.3 Long-term Effectiveness and Permanence. The following paragraphs assess the long-term effectiveness and permanence of the proposed actions of this alternative.

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1 SA 6. The long-term effectiveness of a low permeability landfill cover at controlling
2 potential future releases from the unsaturated zone beneath the landfill would depend on
3 maintenance of cap integrity. When adequately installed and maintained, low permeability
4 cover systems have a history of effectively reducing surface infiltration to landfill
5 materials, promoting surface water drainage, minimizing erosion, and isolating landfill
6 materials from the environment.

7
8 A landfill cover system would not reduce potential future releases from the saturated zone.

9
10 AOC 9. The long-term effectiveness and permanence of this alternative is similar to that
11 discussed in Subsection 8.4.2.3.

12
13 AOC 11. The long-term effectiveness and permanence of this alternative is similar to that
14 discussed in Subsection 8.4.2.3.

15
16 SA 12. The long-term effectiveness of a low permeability landfill cover at controlling
17 exposure to surface soil and potential future releases from the unsaturated zone beneath
18 the landfill would depend on maintenance of cap integrity. When adequately installed and
19 maintained, low permeability cover systems have a history of effectively reducing surface
20 infiltration to landfill materials, promoting surface water drainage, minimizing erosion, and
21 isolating landfill materials from the environment.

22
23 A landfill cover system would not reduce potential future releases from the saturated zone.

24
25 SA 13. The long-term effectiveness of a low permeability landfill cover at controlling
26 exposure to surface soil and potential future releases from the unsaturated zone beneath
27 the landfill would depend on the maintenance of cap integrity. When adequately installed
28 and maintained, low permeability cover systems have a history of effectively reducing
29 surface infiltration to landfill materials, promoting surface water drainage, minimizing
30 erosion, and isolating landfill materials from the environment.

31
32 A landfill cover system would not reduce potential future releases from the saturated zone.

1 AOC 40. The long-term effectiveness and permanence of this alternative is similar to that
2 discussed in Subsection 8.4.2.3.

3
4 AOC 41. The long-term effectiveness of a low permeability landfill cover at controlling
5 exposure to surface soil and potential future releases from the unsaturated zone beneath
6 the landfill would depend on the maintenance of cap integrity. When adequately installed
7 and maintained, low permeability cover systems have a history of effectively reducing
8 surface infiltration to landfill materials, promoting surface water drainage, minimizing
9 erosion, and isolating landfill materials from the environment.

10
11 A landfill cover system would not reduce potential future releases from the saturated zone.

12
13 **8.5.2.4 Reduction of Toxicity, Mobility, and Volume Through Treatment.** The
14 following paragraphs assess the reduction of toxicity, mobility, and volume of
15 contaminants through treatment offered by the proposed actions of this alternative.

16
17 SA 6. Reduction of toxicity, mobility, or volume of contaminants through treatment
18 would not be achieved. By reducing the potential for contaminant leaching in the
19 unsaturated zone, the potential for contaminant migration to groundwater would be
20 reduced.

21
22 AOC 9. The reduction of toxicity, mobility, and volume through treatment is similar to
23 that discussed in Subsection 8.4.2.4.

24
25 AOC 11. The reduction of toxicity, mobility, and volume through treatment is similar to
26 that discussed in Subsection 8.4.2.4.

27
28 SA 12. Reduction of toxicity, mobility, or volume of contaminants through treatment
29 would not be achieved. By reducing the potential for contaminant leaching in the
30 unsaturated zone, the potential for contaminant migration to groundwater would be
31 reduced.

32
33 SA 13. Reduction of toxicity, mobility, or volume of contaminants through treatment
34 would not be achieved. By reducing the potential for contaminant leaching in the

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1 unsaturated zone, the potential for contaminant migration to groundwater would be
2 reduced.

3
4 AOC 40. The reduction of toxicity, mobility, and volume through treatment is similar to
5 that discussed in Subsection 8.4.2.4.

6
7 AOC 41. Reduction of toxicity, mobility, or volume of contaminants through treatment
8 would not be achieved. By reducing the potential for contaminant leaching in the
9 unsaturated zone, the potential for contaminant migration to groundwater would be
10 reduced.

11
12 **8.5.2.5 Short-term Effectiveness.** The following paragraphs assess the short-term
13 effectiveness of the actions proposed at each of the landfills.

14
15 SA 6. This alternative would be expected to present minimal short-term risks to workers,
16 the community, and the environment. Risk to the community would be minimal because
17 residences are not close enough to the site to be impacted by noise or dust potentially
18 generated from cover system placement activities. It is anticipated that delivery of
19 construction of materials can be planned to avoid creating traffic congestion and hazards.

20
21 Grading the landfill prior to capping could present potential risk to workers if hazardous
22 materials are uncovered. Exposure to potentially contaminated soil and debris could be
23 reduced to a safe level by worker adherence to general health and safety practices, and use
24 of personnel monitoring during any intrusive activities at the landfill.

25
26 AOC 9. The short-term effectiveness of this alternative is similar to that discussed in
27 Subsection 8.4.2.5.

28
29 AOC 11. The short-term effectiveness of this alternative is similar to that discussed in
30 Subsection 8.4.2.5.

31
32 SA 12. This alternative would be expected to present minimal short-term risks to
33 workers, the community, and the environment. Risk to the community would be minimal

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1 because residences are not close enough to the site to be impacted by noise or dust
2 potentially generated from cover system placement activities. It is anticipated that delivery
3 of construction materials can be planned to avoid creating traffic congestion and hazards.

4
5 Grading the landfill prior to capping could present potential risk to workers if hazardous
6 materials are uncovered. Exposure to potentially contaminated soil and debris could be
7 reduced to a safe level by worker adherence to general health and safety practices, and use
8 of personnel monitoring during any intrusive activities at the landfill.

9
10 SA 13. This alternative would be expected to present minimal short-term risks to
11 workers, the community, and the environment. Risk to the community would be minimal
12 because residences are not close enough to the site to be impacted by noise or dust
13 potentially generated from cover system placement activities. It is anticipated that delivery
14 of construction can be planned to avoid creating traffic congestion and hazards.

15
16 Grading the landfill prior to capping could present potential risk to workers if hazardous
17 materials are uncovered. Exposure to potentially contaminated soil and debris could be
18 reduced to a safe level by worker adherence to general health and safety practices, and use
19 of personnel monitoring during any intrusive activities at the landfill.

20
21 AOC 40. The short-term effectiveness of this alternative is similar to that discussed in
22 Subsection 8.4.2.5.

23
24 AOC 41. This alternative would be expected to present minimal short-term risks to
25 workers, the community, and the environment. Risk to the community would be minimal
26 because residences are not close enough to the site to be impacted by noise or dust
27 potentially generated from cover system placement activities. It is anticipated that delivery
28 of construction materials can be planned to avoid creating traffic congestion and hazards.

29
30 Grading the landfill prior to capping could present potential risk to workers if hazardous
31 materials are uncovered. Exposure to potentially contaminated soil and debris could be
32 reduced to a safe level by worker adherence to general health and safety practices, and use
33 of personnel monitoring during any intrusive activities at the landfill.

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1 **8.5.2.6 Implementability.** The following paragraphs assess the implementability of the
2 actions proposed at each of the landfills.

3
4 SA 6. Placement of land use restrictions on property currently owned by the U.S. Army
5 would be easily implemented upon property transfer. The filing of a Record Notice of
6 Landfill Operation, in conformance with 310 CMR 19.141, is an easily implementable land
7 use restriction.

8
9 Cover system construction can be accomplished using standard construction procedures
10 and conventional earthmoving equipment. Many engineering and construction companies
11 are qualified to design and construct a landfill cover system. Materials required to
12 construct a low-permeability cover system are readily available. Post-closure monitoring
13 and maintenance are easily implementable. Installation of the cover system could increase
14 the scope of potential future remedial actions at the site, if these actions required access to
15 the debris.

16
17 According to the NCP, no federal, state, or local permits are required for on-site response
18 actions conducted pursuant to CERCLA, although coordination with review agencies is
19 recommended. Placement of the cover system would not require any permits, because it is
20 an on-site activity. Post-closure technical requirements of the Massachusetts Solid Waste
21 Management Regulations (310 CMR 19.000) would be met by this alternative. During
22 construction of the cover system, stormwater runoff would be controlled to minimize
23 erosion and potential surface water contamination.

24
25 AOC 9. The implementability of this alternative is similar to that discussed in
26 Subsection 8.4.2.6.

27
28 AOC 11. The implementability of this alternative is similar to that discussed in
29 Subsection 8.4.2.6.

30
31 SA 12. Placement of land use restrictions on property currently owned by the U.S. Army
32 would be easily implemented upon property transfer. The filing of a Record Notice of

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1 Landfill Operation, in conformance with 310 CMR 19.141, is an easily implementable land
2 use restriction.

3
4 Cover system construction can be accomplished using standard construction procedures
5 and conventional earthmoving equipment. Many engineering and construction companies
6 are qualified to design and construct a landfill cover system. Materials required to
7 construct a low-permeability cover system are readily available. Post-closure monitoring
8 and maintenance are easily implementable. Installation of the cover system could increase
9 the scope of potential future remedial actions at the site, if these actions required access to
10 the debris.

11
12 According to the NCP, no federal, state, or local permits are required for on-site response
13 actions conducted pursuant to CERCLA, although coordination with review agencies is
14 recommended. Placement of the cover system would not require any permits, because it is
15 an on-site activity. Post-closure technical requirements of the Massachusetts Solid Waste
16 Management Regulations (310 CMR 19.000) would be met by this alternative. During
17 construction of the cover system, stormwater runoff would be controlled to minimize
18 erosion and potential surface water contamination.

19
20 SA 13. Placement of land use restrictions on property currently owned by the U.S. Army
21 would be easily implemented upon property transfer. The filing of a Record Notice of
22 Landfill Operation, in conformance with 310 CMR 19.141, is an easily implementable land
23 use restriction.

24
25 Cover system construction can be accomplished using standard construction procedures
26 and conventional earthmoving equipment. Many engineering and construction companies
27 are qualified to design and construct a landfill cover system. Materials required to
28 construct a low-permeability cover system are readily available. Post-closure monitoring
29 and maintenance are easily implementable. Installation of the cover system could increase
30 the scope of potential future remedial actions at the site, if these actions required access to
31 the debris.

32
33 According to the NCP, no federal, state, or local permits are required for on-site response
34 actions conducted pursuant to CERCLA, although coordination with review agencies is
35 recommended. Placement of the cover system would not require any permits, because it is

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1 an on-site activity. Post-closure technical requirements of the Massachusetts Solid Waste
2 Management Regulations (310 CMR 19.000) would be met by this alternative. During
3 construction of the cover system, stormwater runoff would be controlled to minimize
4 erosion and potential surface water contamination.

5
6 AOC 40. The implementability of this alternative is similar to that discussed in
7 Subsection 8.4.2.6.

8
9 AOC 41. Placement of land use restrictions on property currently owned by the U.S.
10 Army would be easily implemented upon property transfer.

11
12 Cover system construction can be accomplished using standard construction procedures
13 and conventional earthmoving equipment. Many engineering and construction companies
14 are qualified to design and construct a landfill cover system. Materials required to
15 construct a low-permeability cover system are readily available. Post-closure monitoring
16 and maintenance are easily implementable. Installation of the cover system could increase
17 the scope of potential future remedial actions at the site, if these actions required access to
18 the debris.

19
20 According to the NCP, no federal, state, or local permits are required for on-site response
21 actions conducted pursuant to CERCLA, although coordination with review agencies is
22 recommended. Placement of the cover system would not require any permits, because it is
23 an on-site activity. Post-closure technical requirements of the Massachusetts Solid Waste
24 Management Regulations (310 CMR 19.000) would be met by this alternative. During
25 construction of the cover system, stormwater runoff would be controlled to minimize
26 erosion and potential surface water contamination.

27
28 **8.5.2.7 Cost.** The cost estimate for Alternative 5 includes estimates of direct and indirect
29 capital costs and O&M costs. Direct capital costs included for this alternative include site
30 preparation, excavation of sediment and debris, drum removal, cap construction, site
31 restoration and monitoring well installation. A 25 percent contingency is included in
32 direct cost items to account for unforeseen project complexities (e.g., adverse weather
33 conditions and inadequate site characterization).

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O&M costs include landfill cover maintenance, and environmental monitoring for groundwater, wetlands, and sediment.

Table 8-17 summarizes the cost estimate for Alternative 5. The total capital cost (direct plus indirect costs) is estimated to be \$17,843,000. O&M costs are estimated to be \$165,000 per year.

To enable evaluation costs that would occur over different time periods, the table also includes a present worth analysis. Present worth represents the amount of money that, if invested now and disbursed as needed, would be sufficient to cover all costs associated with the remedial action over its planned life. A discount rate of 7 percent before taxes and after inflation is used as recommended in OSWER Directive 9355.3-20. Unless noted otherwise, costs are based on a 30-year time frame. The estimated total present worth is \$19,607,000. Cost calculations are included in Appendix D.

8.6 ALTERNATIVE 6: CAP-IN-PLACE AT AOC 41 AND SAS 6, 12, AND 13; AND EXCAVATION AND CONSOLIDATION OF AOCs 9, 11, AND 40

This subsection describes Alternative 6, evaluates the alternative using the seven evaluation criteria, and provides a cost estimate.

8.6.1 Description of Alternative 6

Alternative 6 proposes capping at AOC 41 and SAs 6, 12, 13; excavating debris from AOCs 9, 11, and 40; and consolidating the excavated debris in a proposed secure landfill near Shepley's Hill Landfill. Based on available information, these areas contain non-hazardous debris only. The SA/AOCs will be treated as construction debris landfills.

Alternative 6 also includes removing exposed drums at Cold Spring Brook Landfill (AOC 40) to remove a potential source of contamination, and excavating sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments. These actions were described previously in the FS for AOC 40 (ABB-ES, 1994b).

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Key components of Alternative 6 include:

Cap-in-Place AOC 41, SAs 6, 12, 13

- Mobilization/demobilization;
- Site preparation;
- UXO monitoring at SAs 6, 12 and AOC 41;
- Cap construction;
- Site restoration;
- Wetland restoration;
- Institutional controls;
- Cover system monitoring and maintenance; and
- Five-year site reviews.

Excavation and Consolidation at AOCs 9, 11 and 40

- Mobilization/demobilization;
- AOC 40 sediment removal and disposal;
- AOC 40 drum removal and disposal;
- Debris excavation and backfill at AOCs 9, 11 and 40;
- Wetlands restoration;
- Consolidation of excavated debris at Consolidation Landfill;
- Institutional controls;
- Cover system monitoring and maintenance at Consolidation Landfill; and
- Five-year Site Reviews;

8.6.1.2 Description of Cap-In-Place Components for Alternative 6.

Mobilization/demobilization. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

1 Site preparation. This component is similar to that discussed in Alternative 2,
2 Subsection 8.2.1.3.

3
4 UXO monitoring at SAs 6, 12 and AOC 41. This component is similar to that discussed
5 in Alternative 5, Subsection 8.5.1.2.

6
7 Cap construction. This component is similar to that discussed in Alternative 2,
8 Subsection 8.2.1.3.

9
10 Site restoration. This component is similar to that discussed in Alternative 2,
11 Subsection 8.2.1.3.

12
13 Wetland restoration. This component is similar to that discussed in Alternative 2,
14 Subsection 8.2.1.3.

15
16 Institutional controls. This component is similar to that discussed in Alternative 2,
17 Subsection 8.2.1.3.

18
19 Cover system monitoring and maintenance. This component is similar to that discussed in
20 Alternative 2, Subsection 8.2.1.3.

21
22 Five-year site reviews. This component is similar to that discussed in Alternative 2,
23 Subsection 8.2.1.3.

24
25 **8.6.1.3 Description of Excavate and Consolidate AOCs 9, 11 and AOC 40**
26 **Components for Alternative 6.**

27
28 Mobilization/demobilization. This component is similar to that discussed in Alternative 2,
29 Subsection 8.2.1.3.

30
31 Site preparation. This component is similar to that discussed in Alternative 2,
32 Subsection 8.2.1.3.

33
34 Sediment removal and disposal at AOC 40. This component is similar to that discussed in
35 Alternative 2, Subsection 8.2.1.3.

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1
2 Drum removal and disposal at AOC 40. This component is similar to that discussed in
3 Alternative 2, Subsection 8.2.1.3.

4
5 Debris excavation and backfill at AOCs 9, 11 and 40. This component for AOC 9 and
6 AOC 40 is similar to that discussed in Alternative 4, Subsection 8.4.1.3.

7
8 At AOC 11, excavation of debris would be accomplished in phases because some debris is
9 buried below the groundwater table. The site is between wetlands to the north and south,
10 and adjacent to the Nashua River to the east. A natural 40 ft wide berm along the Nashua
11 River separates the debris from the river water. This berm is 8 to 10 feet above normal
12 river elevations, but still below flood stage. Excavation would be planned for the low-
13 flow summer months. The first phase would be to excavate all of the debris above the
14 watertable utilizing a backhoe, bulldozer and trucks. The estimated volume of debris
15 above groundwater is about 90 percent of the total amount of AOC 11. The second phase,
16 removing the debris (about 10 percent) from below groundwater, would require
17 dewatering of one limited area at a time, then excavating and immediately backfilling.
18 Dewatering would consist of a two rows of individual sumps either side of the debris to
19 intercept groundwater from the river and from the upland hill. The length of the
20 dewatered excavation would vary from 50 to 100 ft. After one 100-ft long section is
21 excavated and backfilled, the operation would move along until all of the 500-ft long
22 excavation of debris is removed. Additional soils investigation would be necessary during
23 design to determine soil properties and limits of debris.

24
25 Wetlands restoration. This component is similar to that discussed in Alternative 2,
26 Subsection 8.2.1.3.

27
28 Consolidation of excavated debris at Consolidation Landfill. This component is similar to
29 that discussed in Alternative 4, Subsection 8.4.1.3. In Alternative 6, the Consolidation
30 Landfill volume would be 343,000 cy.

31
32 Institutional controls. This component is similar to that discussed in Alternative 2,
33 Subsection 8.2.1.3.

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1
2 Cover system monitoring and maintenance at Consolidation Landfill. This component is
3 similar to that discussed in Alternative 4, Subsection 8.4.1.3.

4
5 Five-year site reviews. This component is similar to that discussed in Alternative 2,
6 Subsection 8.2.1.3.

7
8 **8.6.2 Detailed Evaluation of Alternative 6**

9
10 The following subsections present an assessment of Alternative 6 according to the seven
11 evaluation criteria.

12
13 **8.6.2.1 Overall Protection of Human Health and the Environment.** The following
14 paragraphs assess how the proposed actions of this alternative would provide protection
15 of human health and the environment.

16
17 SA 6. Overall protection of human health and the environment is similar to that discussed
18 in Subsection 8.5.2.1.

19
20 AOC 9. Overall protection of human health and the environment is similar to that
21 discussed in Subsection 8.5.2.1.

22
23 AOC 11. This alternative would provide protection of human health and the environment
24 by excavating landfill materials and then disposing of them at the consolidation facility.
25 This would prevent potential future exposure to surface soil and sediment and would
26 prevent potential future releases from landfill debris to groundwater. However, moving
27 the landfill debris to a separate consolidation facility would transfer the risk of potential
28 releases to another location. Because the PRE did not identify significant potential for
29 human or ecological exposure risk at AOC 11, the risk reduction benefit from excavating
30 and consolidating AOC 11 is considered low.

31
32 SA 12. Overall protection of human health and the environment is similar to that
33 discussed in Subsection 8.5.2.1.
34

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1 SA 13. Overall protection of human health and the environment is similar to that
2 discussed in Subsection 8.5.2.1.

3
4 AOC 40. Overall protection of human health and the environment is similar to that
5 discussed in Subsection 8.5.2.1.

6
7 AOC 41. Overall protection of human health and the environment is similar to that
8 discussed in Subsection 8.5.2.1.

9
10 **8.6.2.2 Compliance with ARARs.** Tables 8-18, 8-19, and 8-20 summarize how
11 Alternative 6 will attain ARARs.

12
13 **8.6.2.3 Long-term Effectiveness and Permanence.** The following paragraphs assess
14 the long-term effectiveness and permanence of the proposed actions of this alternative.

15
16 SA 6. The long-term effectiveness and permanence of this alternative is similar to that
17 discussed in Subsection 8.5.2.3.

18
19 AOC 9. The long-term effectiveness and permanence of this alternative is similar to that
20 discussed in Subsection 8.5.2.3.

21
22 AOC 11. Excavation of landfill debris would effectively prevent human and ecological
23 exposure and would prevent the landfill from being a potential source of future
24 groundwater contamination. The effectiveness of the consolidation facility at isolating
25 landfill debris, would depend on the quality of construction and proper maintenance of
26 cover and leachate collection systems. Landfills that include groundwater protection
27 systems with leachate collection, cover systems, and long-term monitoring and
28 maintenance have a history of effectively isolating wastes from the environment.

29
30 SA 12. The long-term effectiveness and permanence of this alternative is similar to that
31 discussed in Subsection 8.5.2.3.

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1 SA 13. The long-term effectiveness and permanence of this alternative is similar to that
2 discussed in Subsection 8.5.2.3.

3
4 AOC 40. The long-term effectiveness and permanence of this alternative is similar to that
5 discussed in Subsection 8.5.2.3.

6
7 AOC 41. The long-term effectiveness and permanence of this alternative is similar to that
8 discussed in Subsection 8.5.2.3.

9
10 **8.6.2.4 Reduction of Toxicity, Mobility, and Volume Through Treatment.** The
11 following paragraphs assess the reduction of toxicity, mobility, and volume of
12 contaminants through treatment offered by the proposed actions of this alternative.

13
14 SA 6. The reduction of toxicity, mobility, and volume through treatment is similar to that
15 discussed in Subsection 8.5.2.4.

16
17 AOC 9. The reduction of toxicity, mobility, and volume through treatment is similar to
18 that discussed in Subsection 8.5.2.4.

19
20 AOC 11. Reduction of toxicity, mobility, or volume of landfill contaminants through
21 treatment would not be achieved. By removing landfill debris, the potential for leaching of
22 landfill materials and contamination of groundwater would be reduced. No reduction of
23 toxicity, mobility, or volume of groundwater contaminants would be achieved. Disposal
24 of excavated landfill debris at a consolidation facility with low permeability liner, leachate
25 collection, and low permeability cover would reduce contaminant mobility.

26
27 SA 12. The reduction of toxicity, mobility, and volume through treatment is similar to
28 that discussed in Subsection 8.5.2.4.

29
30 SA 13. The reduction of toxicity, mobility, and volume through treatment is similar to
31 that discussed in Subsection 8.5.2.4.

32
33 AOC 40. The reduction of toxicity, mobility, and volume through treatment is similar to
34 that discussed in Subsection 8.5.2.4.

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1 AOC 41. The reduction of toxicity, mobility, and volume through treatment is similar to
2 that discussed in Subsection 8.5.2.4.

3
4 **8.6.2.5 Short-term Effectiveness.** The following paragraphs assess the short-term
5 effectiveness of the actions proposed at each of the landfills.

6
7 SA 6. The short-term effectiveness of this alternative is similar to that discussed in
8 Subsection 8.5.2.5.

9
10 AOC 9. The short-term effectiveness of this alternative is similar to that discussed in
11 Subsection 8.5.2.5.

12
13 AOC 11. This alternative is expected to present minimal risks to workers, the community,
14 and the environment. Transportation of excavated materials would be planned to avoid
15 creating traffic congestion and hazards to the community. Handling and transportation of
16 any hazardous materials would be conducted according to RCRA and DOT regulations to
17 protect workers and the community.

18
19 Available information does not suggest the presence of hazardous substances that would
20 present a risk to workers during excavation. Worker adherence to general health and
21 safety practices, and use of personnel monitoring would reduce potential exposure to
22 potentially hazardous substances to a safe level. Excavation of landfilled debris and
23 construction of the consolidation facility could generate dust. Dust suppression
24 techniques would reduce potential risk to workers and the community.

25
26 SA 12. The short-term effectiveness of this alternative is similar to that discussed in
27 Subsection 8.5.2.5.

28
29 SA 13. The short-term effectiveness of this alternative is similar to that discussed in
30 Subsection 8.5.2.5.

31
32 AOC 40. The short-term effectiveness of this alternative is similar to that discussed in
33 Subsection 8.5.2.5.

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AOC 41. The short-term effectiveness of this alternative is similar to that discussed in Subsection 8.5.2.5.

8.6.2.6 Implementability. The following paragraphs assess the implementability of the actions proposed at each of the landfills.

SA 6. The implementability of this alternative is similar to that discussed in Subsection 8.5.2.6.

AOC 9. The implementability of this alternative is similar to that discussed in Subsection 8.5.2.6.

AOC 11. Landfill excavation and construction can be accomplished using standard construction procedures and conventional earthmoving equipment, and many engineering and construction companies are qualified and available. Successful implementation of this alternative is contingent on the approval and construction of a consolidation facility to accept the excavated debris. The consolidation facility would be constructed and maintained to effectively isolate debris excavated from AOC 11. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions at AOC 11.

All activities to excavate AOC 11 would be conducted on-site, and permits would not be required. Design, construction, operation, closure, and post-closure monitoring and maintenance of the consolidation facility would be conducted according to the technical requirements of Massachusetts 310 CMR 19.000.

Consolidation of this disposal area with others reduce the administrative burden and complexity of implementing the long-term monitoring and maintenance requirements of 310 CMR 19.000 at separate disposal areas.

SA 12. The implementability of this alternative is similar to that discussed in Subsection 8.5.2.6.

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1 SA 13. The implementability of this alternative is similar to that discussed in
2 Subsection 8.5.2.6.

3
4 AOC 40. The implementability of this alternative is similar to that discussed in
5 Subsection 8.5.2.6.

6
7 AOC 41. The implementability of this alternative is similar to that discussed in
8 Subsection 8.5.2.6.

9
10 **8.6.2.7 Cost.** The cost estimate for Alternative 6 includes estimates of direct and indirect
11 capital costs and O&M costs. Direct capital costs included for this alternative include site
12 preparation, sediment and debris excavation, drum removal, cap construction site
13 restoration and monitoring well installation. A 25 percent contingency is included in
14 direct cost items to account for unforeseen project complexities (e.g., adverse weather
15 conditions and inadequate site characterization).

16
17 O&M costs include landfill cover maintenance, and environmental monitoring for
18 groundwater, wetlands, and sediment.

19
20 Table 8-21 summarizes the cost estimate for Alternative 6. The total capital cost (direct
21 plus indirect costs) is estimated to be \$19,828,000. O&M costs are estimated to be
22 \$161,000 per year.

23
24 To enable evaluation costs that would occur over different time periods, the table also
25 includes a present worth analysis. Present worth represents the amount of money that, if
26 invested now and disbursed as needed, would be sufficient to cover all costs associated
27 with the remedial action over its planned life. A discount rate of 7 percent before taxes
28 and after inflation is used as recommended in OSWER Directive 9355.3-20. Unless noted
29 otherwise, costs are based on a 30-year time frame. The estimated total present worth is
30 \$21,585,00. Cost calculations are included in Appendix D.

8.7 ALTERNATIVE 7: CAP-IN-PLACE AT ALL SEVEN DISPOSAL AREAS

This subsection describes Alternative 7, evaluates the alternative using the seven evaluation criteria, and provides a cost estimate.

This alternative includes construction of a cap over each of the seven disposal sites. Alternative 7 also includes removing exposed drums at AOC 40 to remove a potential source of contamination, and excavation of sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments. These actions at AOC 40 were described previously in the FS for AOC 40 (ABB-ES, 1994b).

8.7.1 Description Of Alternative 7

Key components of Alternative 7 include:

Cap-in-Place AOCs 9, 11, 40, 41 and SAs 6, 12, 13

- Mobilization/demobilization;
- Site preparation;
- AOC 40 sediment removal and disposal;
- AOC 40 drum removal and disposal;
- UXO monitoring;
- Cap construction;
- Site restoration;
- Wetland restoration;
- Institutional controls;
- Cover system monitoring and maintenance; and
- Five-year site reviews.

8.7.1.1 Description of Cap-In-Place Components for Alternative 7.

Mobilization/demobilization. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

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1 Site preparation. This component is similar to that discussed in Alternative 2,
2 Subsection 8.2.1.3.

3
4 Sediment removal and disposal at AOC 40. This component is similar to that discussed in
5 Alternative 2, Subsection 8.2.1.3.

6
7 Drum removal and disposal at AOC 40. This component is similar to that discussed in
8 Alternative 2, Subsection 8.2.1.3.

9
10 UXO monitoring. This component is similar to that discussed in Alternative 5,
11 Subsection 8.5.1.2.

12
13 Cap construction. This component is similar to that discussed in Alternative 2,
14 Subsection 8.2.1.3..

15
16 Site restoration. This component is similar to that discussed in Alternative 2,
17 Subsection 8.2.1.3.

18
19 Wetland restoration. This component is similar to that discussed in Alternative 2,
20 Subsection 8.2.1.3.

21
22 Institutional controls. This component is similar to that discussed in Alternative 2,
23 Subsection 8.2.1.3.

24
25 Cover system monitoring and maintenance. This component is similar to that discussed in
26 Alternative 2, Subsection 8.2.1.3, and

27
28 Five-year site reviews. This component is similar to that discussed in Alternative 2,
29 Subsection 8.2.1.3.

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8.7.2 Detailed Evaluation of Alternative 7

The following subsections present an assessment of Alternative 7 according to the seven evaluation criteria.

8.7.2.1 Overall Protection of Human Health and the Environment. The following paragraphs assess how the proposed actions of this alternative would provide protection of human health and the environment.

SA 6. Overall protection of human health and the environment is similar to that discussed in Subsection 8.5.2.1.

AOC 9. Overall protection of human health and the environment is similar to that discussed in Subsection 8.2.2.1.

AOC 11. Overall protection of human health and the environment is similar to that discussed in Subsection 8.3.2.1.

SA 12. Overall protection of human health and the environment is similar to that discussed in Subsection 8.5.2.1.

SA 13. Overall protection of human health and the environment is similar to that discussed in Subsection 8.5.2.1.

AOC 40. Overall protection of human health and the environment is similar to that discussed in Subsection 8.2.2.1.

AOC 41. Overall protection of human health and the environment is similar to that discussed in Subsection 8.5.2.1.

8.7.2.2 Compliance with ARARs. Tables 8-22, 8-23, and 8-24 summarize how Alternative 7 will attain ARARs.

8.7.2.3 Long-term Effectiveness and Permanence. The following paragraphs assess the long-term effectiveness and permanence of the proposed actions of this alternative.

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1
2 SA 6. The long-term effectiveness and permanence of this alternative is similar to that
3 discussed in Subsection 8.5.2.3.

4
5 AOC 9. The long-term effectiveness and permanence of this alternative is similar to that
6 discussed in Subsection 8.2.2.3.

7
8 AOC 11. The long-term effectiveness and permanence of this alternative is similar to that
9 discussed in Subsection 8.3.2.3.

10
11 SA 12. The long-term effectiveness and permanence of this alternative is similar to that
12 discussed in Subsection 8.5.2.3.

13
14 SA 13. The long-term effectiveness and permanence of this alternative is similar to that
15 discussed in Subsection 8.5.2.3.

16
17 AOC 40. The long-term effectiveness and permanence of this alternative is similar to that
18 discussed in Subsection 8.2.2.3.

19
20 AOC 41. The long-term effectiveness and permanence of this alternative is similar to that
21 discussed in Subsection 8.5.2.3.

22
23 **8.7.2.4 Reduction of Toxicity, Mobility, and Volume Through Treatment.** The
24 following paragraphs assess the reduction of toxicity, mobility, and volume of
25 contaminants through treatment offered by the proposed actions of this alternative.

26
27 SA 6. The reduction of toxicity, mobility, and volume through treatment is similar to that
28 discussed in Subsection 8.5.2.4.

29
30 AOC 9. The reduction of toxicity, mobility, and volume through treatment is similar to
31 that discussed in Subsection 8.2.2.4.
32

1 AOC 11. The reduction of toxicity, mobility, and volume through treatment is similar to
2 that discussed in Subsection 8.3.2.4.

3
4 SA 12. The reduction of toxicity, mobility, and volume through treatment is similar to
5 that discussed in Subsection 8.5.2.4.

6
7 SA 13. The reduction of toxicity, mobility, and volume through treatment is similar to
8 that discussed in Subsection 8.5.2.4.

9
10 AOC 40. The reduction of toxicity, mobility, and volume through treatment is similar to
11 that discussed in Subsection 8.2.2.4.

12
13 AOC 41. The reduction of toxicity, mobility, and volume through treatment is similar to
14 that discussed in Subsection 8.5.2.4.

15
16 **8.7.2.5 Short-term Effectiveness.** The following paragraphs assess the short-term
17 effectiveness of the actions proposed at each of the landfills.

18
19 SA 6. The short-term effectiveness of this alternative is similar to that discussed in
20 Subsection 8.5.2.5.

21
22 AOC 9. The short-term effectiveness of this alternative is similar to that discussed in
23 Subsection 8.2.2.5.

24
25 AOC 11. The short-term effectiveness of this alternative is similar to that discussed in
26 Subsection 8.3.2.5.

27
28 SA 12. The short-term effectiveness of this alternative is similar to that discussed in
29 Subsection 8.5.2.5.

30
31 SA 13. The short-term effectiveness of this alternative is similar to that discussed in
32 Subsection 8.5.2.5.

33
34 AOC 40. The short-term effectiveness of this alternative is similar to that discussed in
35 Subsection 8.2.2.5.

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1
2 AOC 41. The short-term effectiveness of this alternative is similar to that discussed in
3 Subsection 8.5.2.5.

4
5 **8.7.2.6 Implementability.** The following paragraphs assess the implementability of the
6 actions proposed at each of the landfills.

7
8 SA 6. The implementability of this alternative is similar to that discussed in
9 Subsection 8.5.2.6.

10
11 AOC 9. The implementability of this alternative is similar to that discussed in
12 Subsection 8.2.2.6.

13
14 AOC 11. The implementability of this alternative is similar to that discussed in
15 Subsection 8.3.2.6.

16
17 SA 12. The implementability of this alternative is similar to that discussed in
18 Subsection 8.5.2.6.

19
20 SA 13. The implementability of this alternative is similar to that discussed in
21 Subsection 8.5.2.6.

22
23 AOC 40. The implementability of this alternative is similar to that discussed in
24 Subsection 8.2.2.6.

25
26 AOC 41. The implementability of this alternative is similar to that discussed in
27 Subsection 8.5.2.6.

28
29 **8.7.2.7 Cost.** The cost estimate for Alternative 7 includes estimates of direct and indirect
30 capital costs and O&M costs. Direct capital costs included for this alternative include site
31 preparation, sediment and debris excavation, drum removal, cap construction, site
32 restoration and monitoring well installation. A 25 percent contingency is included in

1 direct cost items to account for unforeseen project complexities (e.g., adverse weather
2 conditions and inadequate site characterization).

3
4 O&M costs include landfill cover maintenance and environmental monitoring for
5 groundwater, wetlands and sediment.

6
7 Table 8-25 summarizes the cost estimate for Alternative 7. The total capital cost (direct
8 plus indirect costs) is estimated to be \$9,832,000. O&M costs are estimated to be
9 \$221,000 per year.

10
11 To enable evaluation costs which would occur over different time periods, the table also
12 includes a present worth analysis. Present worth represents the amount of money that, if
13 invested now and disbursed as needed, would be sufficient to cover all costs associated
14 with the remedial action over its planned life. A discount rate of 7 percent before taxes
15 and after inflation is used as recommended in OSWER Directive 9355.3-20. Unless noted
16 otherwise, costs are based on a 30-year time frame. The estimated total present worth is
17 \$12,466,000. Cost calculations are included in Appendix D.

18
19
20 **8.8 ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11 (DISPOSAL IN**
21 **CONSOLIDATION LANDFILL); AND EXCAVATION AND CONSOLIDATION OF**
22 **AOCs 9, 40, AND 41, AND SAs 6, 12, AND 13**

23
24 This subsection describes and evaluates Alternative 8 using the seven evaluation criteria,
25 and provides a cost estimate.

26
27 **8.8.1 Description Of Alternative 8**

28
29 Alternative 8 proposes limited removal of debris from AOC 11; excavating debris from
30 AOCs 9, 40, 41 and SAs 6, 12, 13; and consolidating the excavated debris in a proposed
31 secure landfill near Shepley's Hill Landfill. Based on available information, these areas
32 contain non-hazardous debris only. The SA/AOCs will be treated as construction debris
33 landfills.
34

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1 Based on archeological monitoring conducted during the predesign investigations at SA 6,
2 further study is assumed to be warranted prior to disturbance of waste at this site. Work
3 at this site would need to comply with the requirements of the Archeological and
4 Historical Preservation Act Regulations (40 CFR Part 6), which establishes procedures to
5 provide for preservation of historical and archeological data which might be destroyed
6 through alteration of terrain as a result of a Federal construction project. Archeological
7 monitoring at the remaining six SA/AOCs is not anticipated.

8
9 Alternative 8 also includes removing exposed drums at Cold Spring Brook Landfill
10 (AOC 40) to remove a potential source of contamination, and excavating sediment from
11 two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to
12 contaminated sediments. These actions were described previously in the FS for AOC 40
13 (ABB-ES, 1994b).

14
15 The key components of Alternative 8 include:

16 17 Limited Removal at AOC 11

- 18
19 • Mobilization/demobilization;
20 • Excavation of debris and transportation to the Consolidation Landfill;
21 • Backfilling site; and
22 • Site restoration.

23 24 Excavation and Consolidation at AOCs 9, 40, 41 and SAs 6, 12, 13

- 25
26 • Mobilization/demobilization;
27 • AOC 40 sediment removal and disposal;
28 • AOC 40 drum removal and disposal;
29 • UXO monitoring at SAs 6, 12 and AOC 41;
30 • Debris excavation and backfill;
31 • Wetlands restoration;
32 • Consolidation of excavated debris at Consolidation Landfill;

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- Institutional controls;
- Cover system monitoring and maintenance at Consolidation Landfill; and
- Five-year site reviews;

8.8.1.1 Description of Limited Removal Components for Alternative 8.

Mobilization/demobilization. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Excavation of debris and transportation to the Consolidation Landfill. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Backfilling site. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Site restoration. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

8.8.1.2 Description of Excavation and Consolidation Components for Alternative 8.

Mobilization/demobilization. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Site preparation. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Sediment removal and disposal at AOC 40. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Drum removal and disposal at AOC 40. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

UXO monitoring. This component is similar to that discussed in Alternative 2, Subsection 8.5.1.2.

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1 Debris excavation and backfill at AOCs 9 and 40. This component is similar to that
2 discussed in Alternative 4, Subsection 8.4.1.3.

3
4 Wetlands restoration. This component is similar to that discussed in Alternative 2,
5 Subsection 8.2.1.3.

6
7 Consolidation of excavated debris at Consolidation Landfill. This component is similar to
8 that discussed in Alternative 4, Subsection 8.4.1.3. The Consolidation Landfill volume for
9 Alternative 8 is 327,000 cy.

10
11 Institutional controls. This component is similar to that discussed in Alternative 2,
12 Subsection 8.2.1.3.

13
14 Cover system monitoring and maintenance at Consolidation Landfill. This component is
15 similar to that discussed in Alternative 4, Subsection 8.4.1.3.

16
17 Five-year site reviews. This component is similar to that discussed in Alternative 2,
18 Subsection 8.2.1.3.

19 20 **8.8.2 Detailed Evaluation of Alternative 8**

21
22 The following subsections present an assessment of Alternative 8 according to the seven
23 evaluation criteria.

24
25 **8.8.2.1 Overall Protection of Human Health and the Environment.** The following
26 paragraphs assess how the proposed actions of this alternative would provide protection
27 of human health and the environment.

28
29 SA 6. This alternative would provide protection of human health and the environment by
30 excavating landfill materials and then disposing of them at the consolidation facility. This
31 would prevent potential future exposure to surface soil and sediment and would prevent
32 potential future releases from landfill debris to groundwater. However, moving the landfill
33 debris to a separate consolidation facility would transfer the risk of potential releases to

1 another location. Because the PRE did not identify significant potential for human or
2 ecological exposure risk at SA 6, the risk reduction benefit from excavating and
3 consolidating SA 6 is considered low.

4
5 AOC 9. Overall protection of human health and the environment is similar to that
6 discussed Subsection 8.4.2.1.

7
8 AOC 11. Overall protection of human health and the environment is similar to that
9 discussed Subsection 8.4.2.1.

10
11 SA 12. This alternative would provide protection of human health and the environment by
12 excavating landfill materials and then disposing of them at the consolidation facility. This
13 would prevent potential future exposure to surface soil and sediment and would prevent
14 potential future releases from landfill debris to groundwater. However, moving the landfill
15 debris to a separate consolidation facility would transfer the risk of potential releases to
16 another location.

17
18 SA 13. This alternative would provide protection of human health and the environment by
19 excavating landfill materials and then disposing of them at the consolidation facility. This
20 would prevent potential future exposure to surface soil and sediment and would prevent
21 potential future releases from landfill debris to groundwater. However, moving the landfill
22 debris to a separate consolidation facility would transfer the risk of potential releases to
23 another location.

24
25 AOC 40. Overall protection of human health and the environment is similar to that
26 discussed Subsection 8.4.2.1.

27
28 AOC 41. This alternative would provide protection of human health and the environment
29 by excavating landfill materials and then disposing of them at the consolidation facility.
30 This would prevent potential future exposure to surface soil and sediment and would
31 prevent potential future releases from landfill debris to groundwater. However, moving
32 the landfill debris to a separate consolidation facility would transfer the risk of potential
33 releases to another location.

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1 **8.8.2.2 Compliance with ARARs.** Tables 8-26, 8-27, and 8-28 summarize how
2 Alternative 8 will attain ARARs.

3
4 **8.8.2.3 Long-term Effectiveness and Permanence.** The following paragraphs assess
5 the long-term effectiveness and permanence of the proposed actions of this alternative.

6
7 SA 6. Excavation of landfill debris would effectively prevent human and ecological
8 exposure and would prevent the landfill from being a potential source of future
9 groundwater contamination. The effectiveness of the consolidation facility at isolating
10 landfill debris would depend on the quality of construction and proper maintenance of
11 cover and leachate collection systems. Landfills that include groundwater protection
12 systems with leachate collection, cover systems, and long-term monitoring and
13 maintenance have a history of effectively isolating wastes from the environment.

14
15 AOC 9. The long-term effectiveness and permanence of this alternative is similar to that
16 discussed in Subsection 8.4.2.3.

17
18 AOC 11. The long-term effectiveness and permanence of this alternative is similar to that
19 discussed in Subsection 8.4.2.3.

20
21 SA 12. Excavation of landfill debris would effectively prevent human and ecological
22 exposure and would prevent the landfill from being a potential source of future
23 groundwater contamination. The effectiveness of the consolidation facility at isolating
24 landfill debris would depend on the quality of construction and proper maintenance of
25 cover and leachate collection systems. Landfills that include groundwater protection
26 systems with leachate collection, cover systems, and long-term monitoring and
27 maintenance have a history of effectively isolating wastes from the environment.

28
29 SA 13. Excavation of landfill debris would effectively prevent human and ecological
30 exposure and would prevent the landfill from being a potential source of future
31 groundwater contamination. The effectiveness of the consolidation facility at isolating
32 landfill debris, would depend on the quality of construction and proper maintenance of
33 cover and leachate collection systems. Landfills that include groundwater protection

1 systems, with leachate collection, cover systems and long-term monitoring and
2 maintenance have a history of effectively isolating wastes from the environment.

3
4 AOC 40. The long-term effectiveness and permanence of this alternative is similar to that
5 discussed in Subsection 8.4.2.3.

6
7 AOC 41. Excavation of landfill debris would effectively prevent human and ecological
8 exposure and would prevent the landfill from being a potential source of future
9 groundwater contamination. The effectiveness of the consolidation facility at isolating
10 landfill debris would depend on the quality of construction and proper maintenance of
11 cover and leachate collection systems. Landfills that include groundwater protection
12 systems with leachate collection, cover systems, and long-term monitoring and
13 maintenance have a history of effectively isolating wastes from the environment.

14
15 **8.8.2.4 Reduction of Toxicity, Mobility, and Volume Through Treatment.** The
16 following paragraphs assess the reduction of toxicity, mobility, and volume of
17 contaminants through treatment offered by the proposed actions of this alternative.

18
19 SA 6. Reduction of toxicity, mobility, or volume of landfill contaminants through
20 treatment would not be achieved. By removing landfill debris, the potential for leaching of
21 landfill materials and contamination of groundwater would be reduced. No reduction of
22 toxicity, mobility, or volume of groundwater contaminants would be achieved. Disposal
23 of excavated landfill debris at a consolidation facility with low permeability liner, leachate
24 collection, and low permeability cover would reduce contaminant mobility.

25
26 AOC 9. The reduction in toxicity, mobility, and volume is similar to that discussed in
27 Subsection 8.4.2.4.

28
29 AOC 11. The reduction in toxicity, mobility, and volume is similar to that discussed in
30 Subsection 8.4.2.4.

31
32 SA 12. Reduction of toxicity, mobility, or volume of landfill contaminants through
33 treatment would not be achieved. By removing landfill debris, the potential for leaching of
34 landfill materials and contamination of groundwater would be reduced. No reduction of
35 toxicity, mobility, or volume of groundwater contaminants would be achieved. Disposal

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1 of excavated landfill debris at a consolidation facility with low permeability liner, leachate
2 collection, and low permeability cover would reduce contaminant mobility.

3
4 SA 13. Reduction of toxicity, mobility, or volume of landfill contaminants through
5 treatment would not be achieved. By removing landfill debris, the potential for leaching of
6 landfill materials and contamination of groundwater would be reduced. No reduction of
7 toxicity, mobility, or volume of groundwater contaminants would be achieved. Disposal
8 of excavated landfill debris at a consolidation facility with low permeability liner, leachate
9 collection, and low permeability cover would reduce contaminant mobility.

10
11 AOC 40. The reduction in toxicity, mobility, and volume is similar to that discussed in
12 Subsection 8.4.2.4.

13
14 AOC 41. Reduction of toxicity, mobility, or volume of landfill contaminants through
15 treatment would not be achieved. By removing landfill debris, the potential for leaching of
16 landfill materials and contamination of groundwater would be reduced. No reduction of
17 toxicity, mobility, or volume of groundwater contaminants would be achieved. Disposal
18 of excavated landfill debris at a consolidation facility with low permeability liner, leachate
19 collection, and low permeability cover would reduce contaminant mobility.

20
21 **8.8.2.5 Short-term Effectiveness.** The following paragraphs assess the short-term
22 effectiveness of the actions proposed at each of the landfills.

23
24 SA 6. This alternative is expected to present minimal risks to workers, the community,
25 and the environment. Transportation of excavated materials would be planned to avoid
26 creating traffic congestion and hazards to the community. Handling and transportation of
27 any hazardous materials would be conducted according to RCRA and DOT regulations to
28 protect workers and the community.

29
30 Available information does not suggest the presence of hazardous substances which would
31 present a risk to workers during excavation. Worker adherence to general health and
32 safety practices, and use of personnel monitoring would reduce potential exposure to
33 potentially hazardous substances to a safe level. Excavation of landfilled debris and

1 construction of the consolidation facility could generate dust. Dust suppression
2 techniques would reduce potential risk to workers and the community.

3
4 AOC 9. The short-term effectiveness of this alternative is similar to that discussed in
5 Subsection 8.4.2.5.

6
7 AOC 11. The short-term effectiveness of this alternative is similar to that discussed in
8 Subsection 8.4.2.5.

9
10 SA 12. This alternative is expected to present minimal risks to workers, the community,
11 and the environment. Transportation of excavated materials would be planned to avoid
12 creating traffic congestion and hazards to the community. Handling and transportation of
13 any hazardous materials would be conducted according to RCRA and DOT regulations to
14 protect workers and the community.

15
16 Available information does not suggest the presence of hazardous substances which would
17 present a risk to workers during excavation. Worker adherence to general health and
18 safety practices, and use of personnel monitoring would reduce potential exposure to
19 potentially hazardous substances to a safe level. Excavation of landfilled debris and
20 construction of the consolidation facility could generate dust. Dust suppression
21 techniques would reduce potential risk to workers and the community.

22
23 SA 13. This alternative is expected to present minimal risks to workers, the community,
24 and the environment. Transportation of excavated materials would be planned to avoid
25 creating traffic congestion and hazards to the community. Handling and transportation of
26 any hazardous materials would be conducted according to RCRA and DOT regulations to
27 protect workers and the community.

28
29 Available information does not suggest the presence of hazardous substances which would
30 present a risk to workers during excavation. Worker adherence to general health and
31 safety practices, and use of personnel monitoring would reduce potential exposure to
32 potentially hazardous substances to a safe level. Excavation of landfilled debris and
33 construction of the consolidation facility could generate dust. Dust suppression
34 techniques would reduce potential risk to workers and the community.

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1 AOC 40. The short-term effectiveness of this alternative is similar to that discussed in
2 Subsection 8.4.2.5.

3
4 AOC 41. This alternative is expected to present minimal risks to workers, the community,
5 and the environment. Transportation of excavated materials would be planned to avoid
6 creating traffic congestion and hazards to the community. Handling and transportation of
7 any hazardous materials would be conducted according to RCRA and DOT regulations to
8 protect workers and the community.

9
10 Available information does not suggest the presence of hazardous substances which would
11 present a risk to workers during excavation. Worker adherence to general health and
12 safety practices, and use of personnel monitoring would reduce potential exposure to
13 potentially hazardous substances to a safe level. Excavation of landfilled debris and
14 construction of the consolidation facility could generate dust. Dust suppression
15 techniques would reduce potential risk to workers and the community.

16
17 **8.8.2.6 Implementability.** The following paragraphs assess the implementability of the
18 actions proposed at each of the landfills.

19
20 SA 6. Landfill excavation and construction can be accomplished using standard
21 construction procedures and conventional earthmoving equipment, and many engineering
22 and construction companies are qualified and available. Successful implementation of this
23 alternative is contingent on the approval and construction of a consolidation facility to
24 accept the excavated debris. The consolidation facility would be constructed and
25 maintained to effectively isolate debris excavated from SA 6. Implementation of this
26 alternative would not limit or interfere with the ability to perform future remedial actions
27 at SA 6.

28
29 All activities to excavate SA 6 would be conducted on site, and permits would not be
30 required. Design, construction, operation, closure, and post-closure monitoring and
31 maintenance of the consolidation facility would be conducted according to the technical
32 requirements of Massachusetts 310 CMR 19.000.

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1 Consolidation of this disposal area with others reduce the administrative burden and
2 complexity of implementing the long-term monitoring and maintenance requirements of
3 310 CMR 19.000 at separate disposal areas.

4
5 AOC 9. The implementability of this alternative is similar to that discussed in
6 Subsection 8.4.2.6.

7
8 AOC 11. The implementability of this alternative is similar to that discussed in
9 Subsection 8.4.2.6.

10
11 SA 12. Landfill excavation and construction can be accomplished using standard
12 construction procedures and conventional earthmoving equipment, and many engineering
13 and construction companies are qualified and available. Successful implementation of this
14 alternative is contingent on the approval and construction of a consolidation facility to
15 accept the excavated debris. The consolidation facility would be constructed and
16 maintained to effectively isolate debris excavated from SA 12. Implementation of this
17 alternative would not limit or interfere with the ability to perform future remedial actions
18 at SA 12.

19
20 All activities to excavate SA 12 would be conducted on site, and permits would not be
21 required. Design, construction, operation, closure, and post-closure monitoring and
22 maintenance of the consolidation facility would be conducted according to the technical
23 requirements of Massachusetts 310 CMR 19.000.

24
25 Consolidation of this disposal area with others reduce the administrative burden and
26 complexity of implementing the long-term monitoring and maintenance requirements of
27 310 CMR 19.000 at separate disposal areas.

28
29 SA 13. Landfill excavation and construction can be accomplished using standard
30 construction procedures and conventional earthmoving equipment, and many engineering
31 and construction companies are qualified and available. Successful implementation of this
32 alternative is contingent on the approval and construction of a consolidation facility to
33 accept the excavated debris. The consolidation facility would be constructed and
34 maintained to effectively isolate debris excavated from SA 13. Implementation of this

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1 alternative would not limit or interfere with the ability to perform future remedial actions
2 at SA 13.

3
4 All activities to excavate SA 13 would be conducted on-site, and permits would not be
5 required. Design, construction, operation, closure, and post-closure monitoring and
6 maintenance of the consolidation facility would be conducted according to the technical
7 requirements of Massachusetts 310 CMR 19.000.

8 Consolidation of this disposal area with others reduce the administrative burden and
9 complexity of implementing the long-term monitoring and maintenance requirements of
10 310 CMR 19.000 at separate disposal areas.

11
12 AOC 40. The implementability of this alternative is similar to that discussed in
13 Subsection 8.4.2.6.

14
15 AOC 41. Landfill excavation and construction can be accomplished using standard
16 construction procedures and conventional earthmoving equipment, and many engineering
17 and construction companies are qualified and available. Successful implementation of this
18 alternative is contingent on the approval and construction of a consolidation facility to
19 accept the excavated debris. The consolidation facility would be constructed and
20 maintained to effectively isolate debris excavated from AOC 41. Implementation of this
21 alternative would not limit or interfere with the ability to perform future remedial actions
22 at AOC 41.

23
24 All activities to excavate AOC 41 would be conducted on site, and permits would not be
25 required. Design, construction, operation, closure, and post-closure monitoring and
26 maintenance of the consolidation facility would be conducted according to the technical
27 requirements of Massachusetts 310 CMR 19.000.

28
29 Consolidation of this disposal area with others reduce the administrative burden and
30 complexity of implementing the long-term monitoring and maintenance requirements of
31 310 CMR 19.000 at separate disposal areas.

1 **8.8.2.7 Cost.** The cost estimate for Alternative 8 includes estimates of direct and indirect
2 capital costs and O&M costs. Direct capital costs included for this alternative include site
3 preparation, sediment and debris excavation, drum removal, cap construction, site
4 restoration and monitoring well installation. A 25 percent contingency is included in
5 direct cost items to account for unforeseen project complexities (e.g., adverse weather
6 conditions and inadequate site characterization).

7
8 O&M costs include landfill maintenance and environmental monitoring for groundwater,
9 wetlands and sediment.

10
11 Table 8-29 summarizes the cost estimate for Alternative 8. The total capital cost (direct
12 plus indirect costs) is estimated to be \$17,730,000. O&M costs are estimated to be
13 \$56,000 per year.

14
15 To enable evaluation costs which would occur over different time periods, the table also
16 includes a present worth analysis. Present worth represents the amount of money that, if
17 invested now and disbursed as needed, would be sufficient to cover all costs associated
18 with the remedial action over its planned life. A discount rate of 7 percent before taxes
19 and after inflation is used as recommended in OSWER Directive 9355.3-20. Unless noted
20 otherwise, costs are based on a 30-year time frame. The estimated total present worth is
21 \$18,141,000. Cost calculations are included in Appendix D.

22 23 24 **8.9 ALTERNATIVE 9: EXCAVATION AND CONSOLIDATION OF ALL SEVEN DISPOSAL** 25 **AREAS**

26
27 This subsection describes Alternative 9, evaluates the alternative using the seven
28 evaluation criteria, and provides a cost estimate.
29

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8.9.1 Description Of Alternative 9

Alternative 9 proposes excavating construction/demolition debris from SAs 6, 12, 13, AOCs 9, 11, 40 and 41, and consolidating the excavated debris in a proposed secure landfill near Shepley's Hill Landfill. Based on available information, these areas contain non-hazardous debris only. The SA/AOCs will be treated as construction debris landfills.

Based on archeological monitoring conducted during the predesign investigations at SA 6, further study is assumed to be warranted prior to disturbance of waste at this site. Work at this site would need to comply with the requirements of the Archeological and Historical Preservation Act Regulations (40 CFR Part 6), which establishes procedures to provide for preservation of historical and archeological data which might be destroyed through alteration of terrain as a result of a federal construction project. Archeological monitoring at the remaining six SA/AOCs is not anticipated.

Alternative 9 also includes removing exposed drums at Cold Spring Brook Landfill (AOC 40) to remove a potential source of contamination, and excavating sediment from two hot spots in Cold Spring Brook Pond, to reduce ecological risk from exposure to contaminated sediments. These actions were described previously in the FS for AOC 40 (ABB-ES, 1994b).

The key components of Alternative 9 include:

Excavation and Consolidation at AOCs 9, 11, 40, 41 and SAs 6, 12, 13

- Mobilization/demobilization;
- AOC 40 sediment removal and disposal;
- AOC 40 drum removal and disposal;
- UXO monitoring at SAs 6, 12 and AOC 41;
- Debris excavation and backfill;
- Wetlands restoration;
- Consolidation of excavated debris at Consolidation Landfill;

- Institutional controls;
- Cover system monitoring and maintenance at Consolidation Landfill; and
- Five-year site reviews;

8.9.1.1 Description of Excavate and Consolidate Components for Alternative 9

Mobilization/demobilization. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Site preparation. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Sediment removal and disposal at AOC 40. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Drum removal and disposal at AOC 40. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

UXO monitoring. This component is similar to that discussed in Alternative 5, Subsection 8.5.1.2.

Debris excavation and backfill. This component is similar to that discussed in Alternative 4, Subsection 8.4.1.3.

Wetlands restoration. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

Consolidation of excavated debris at Consolidation Landfill. This component is similar to that discussed in Alternative 4, Subsection 8.4.1.3. The Consolidation Landfill volume for Alternative 9 is 366,000 cy.

Institutional controls. This component is similar to that discussed in Alternative 2, Subsection 8.2.1.3.

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1 Cover system monitoring and maintenance at Consolidation Landfill. This component is
2 similar to that discussed in Alternative 4, Subsection 8.4.1.3.

3
4 Five-year site reviews. This component is similar to that discussed in Alternative 2,
5 Subsection 8.2.1.3.

6 7 **8.9.2 Detailed Evaluation of Alternative 9**

8
9 The following subsections present an assessment of Alternative 9 according to the seven
10 evaluation criteria.

11
12 **8.9.2.1 Overall Protection of Human Health and the Environment.** The following
13 paragraphs assess how the proposed actions of this alternative would provide protection
14 of human health and the environment.

15
16 SA 6. Overall protection of human health and the environment is similar to that discussed
17 Subsection 8.8.2.1.

18
19 AOC 9. Overall protection of human health and the environment is similar to that
20 discussed Subsection 8.4.2.1.

21
22 AOC 11. Overall protection of human health and the environment is similar to that
23 discussed Subsection 8.6.2.1.

24
25 SA 12. Overall protection of human health and the environment is similar to that
26 discussed Subsection 8.8.2.1.

27
28 SA 13. Overall protection of human health and the environment is similar to that
29 discussed Subsection 8.8.2.1.

30
31 AOC 40. Overall protection of human health and the environment is similar to that
32 discussed Subsection 8.4.2.1.

1 AOC 41. Overall protection of human health and the environment is similar to that
2 discussed Subsection 8.8.2.1.

3
4 **8.9.2.2 Compliance with ARARs.** Tables 8-30, 8-31, and 8-32 summarize how
5 Alternative 9 will attain ARARs.

6
7 **8.9.2.3 Long-term Effectiveness and Permanence.** The following paragraphs assess
8 the long-term effectiveness and permanence of the proposed actions of this alternative.

9
10 SA 6. The long-term effectiveness and permanence of this alternative is similar to that
11 discussed in Subsection 8.8.2.3.

12
13 AOC 9. The long-term effectiveness and permanence of this alternative is similar to that
14 discussed in Subsection 8.4.2.3.

15
16 AOC 11. The long-term effectiveness and permanence of this alternative is similar to that
17 discussed in Subsection 8.6.2.3.

18
19 SA 12. The long-term effectiveness and permanence of this alternative is similar to that
20 discussed in Subsection 8.8.2.3.

21
22 SA 13. The long-term effectiveness and permanence of this alternative is similar to that
23 discussed in Subsection 8.8.2.3.

24
25 AOC 40. The long-term effectiveness and permanence of this alternative is similar to that
26 discussed in Subsection 8.4.2.3.

27
28 AOC 41. The long-term effectiveness and permanence of this alternative is similar to that
29 discussed in Subsection 8.8.2.3.

30
31 **8.9.2.4 Reduction of Toxicity, Mobility, and Volume Through Treatment.** The
32 following paragraphs assess the reduction of toxicity, mobility, and volume of
33 contaminants through treatment offered by the proposed actions of this alternative.
34

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1 SA 6. The reduction in toxicity, mobility, and volume is similar to that discussed in
2 Subsection 8.8.2.4.

3
4 AOC 9. The reduction in toxicity, mobility, and volume is similar to that discussed in
5 Subsection 8.4.2.4.

6
7 AOC 11. The reduction in toxicity, mobility, and volume is similar to that discussed in
8 Subsection 8.6.2.4.

9
10 SA 12. The reduction in toxicity, mobility, and volume is similar to that discussed in
11 Subsection 8.8.2.4.

12
13 SA 13. The reduction in toxicity, mobility, and volume is similar to that discussed in
14 Subsection 8.8.2.4.

15
16 AOC 40. The reduction in toxicity, mobility, and volume is similar to that discussed in
17 Subsection 8.4.2.4.

18
19 AOC 41. The reduction in toxicity, mobility, and volume is similar to that discussed in
20 Subsection 8.8.2.4.

21 **8.9.2.5 Short-term Effectiveness.** The following paragraphs assess the short-term
22 effectiveness of the actions proposed at each of the landfills.

23
24 SA 6. The short-term effectiveness of this alternative is similar to that discussed in
25 Subsection 8.8.2.5.

26
27 AOC 9. The short-term effectiveness of this alternative is similar to that discussed in
28 Subsection 8.4.2.5.

29
30 AOC 11. The short-term effectiveness of this alternative is similar to that discussed in
31 Subsection 8.6.2.5.

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1 SA 12 The short-term effectiveness of this alternative is similar to that discussed in
2 Subsection 8.8.2.5.

3
4 SA 13. The short-term effectiveness of this alternative is similar to that discussed in
5 Subsection 8.8.2.5.

6
7 AOC 40. The short-term effectiveness of this alternative is similar to that discussed in
8 Subsection 8.4.2.5.

9
10 AOC 41. The short-term effectiveness of this alternative is similar to that discussed in
11 Subsection 8.8.2.5.

12
13 **8.9.2.6 Implementability.** The following paragraphs assess the implementability of the
14 actions proposed at each of the landfills.

15
16 SA 6. The implementability of this alternative is similar to that discussed in
17 Subsection 8.8.2.6.

18
19 AOC 9. The implementability of this alternative is similar to that discussed in
20 Subsection 8.4.2.6.

21
22 AOC 11. The implementability of this alternative is similar to that discussed in
23 Subsection 8.6.2.6.

24
25 SA 12. The implementability of this alternative is similar to that discussed in
26 Subsection 8.8.2.6.

27
28 SA 13. The implementability of this alternative is similar to that discussed in
29 Subsection 8.8.2.6.

30
31 AOC 40. The implementability of this alternative is similar to that discussed in
32 Subsection 8.4.2.6.

33
34 AOC 41. The implementability of this alternative is similar to that discussed in
35 Subsection 8.8.2.6.

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1
2 **8.9.2.7 Cost.** The cost estimate for Alternative 9 includes estimates of direct and indirect
3 capital costs and O&M costs. Direct capital costs included for this alternative include site
4 preparation, sediment and debris excavation, drum removal, cap construction, site
5 restoration and monitoring well installation. A 25 percent contingency is included in
6 direct cost items to account for unforeseen project complexities (e.g., adverse weather
7 conditions and inadequate site characterization).

8
9 O&M costs include landfill cover maintenance and environmental monitoring for
10 groundwater, wetlands and sediment.

11
12 Table 8-33 summarizes the cost estimate for Alternative 9. The total capital cost (direct
13 plus indirect costs) is estimated to be \$19,715,000. O&M costs are estimated to be
14 \$52,000 per year.

15
16 To enable evaluation costs which would occur over different time periods, the table also
17 includes a present worth analysis. Present worth represents the amount of money that, if
18 invested now and disbursed as needed, would be sufficient to cover all costs associated
19 with the remedial action over its planned life. A discount rate of 7 percent before taxes
20 and after inflation is used as recommended in OSWER Directive 9355.3-20. Unless noted
21 otherwise, costs are based on a 30-year time frame. The estimated total present worth is
22 \$20,195,000. Cost calculations are included in Appendix D.
23

9.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

This section compares relative advantages and disadvantages of the landfill management alternatives. The alternatives are complex, because each involves seven sites with various remedial actions. Table 9-1 presents a comparison of the alternatives with regard to the relative degree (i.e., low, medium, high) of conformance to the evaluation criteria. In general, the alternatives offer a higher degree of criteria conformance as they progress in numerical order. For example, Alternative 1 offers a low degree of overall protection of human health and the environment, while Alternative 9 offers a high degree. To further assist in alternatives comparison, distinguishing features of each alternative are discussed in Subsection 9.1.

9.1 ALTERNATIVES COMPARISON

Alternative 1. MADEP landfill closure requirements would not be met for disposal areas at AOC 9, AOC 11, or SA 12. The site investigation, remedial investigation, and feasibility study reports, and records of decision would be submitted to satisfy 310 CMR 19.021 (4)(b) at SA 6, SA 13, AOC 40, and AOC 41.

Alternative 2. This alternative offers a significant amount of protection of human health and the environment at relatively low cost.

Alternative 3. An approximately 20% increase in cost over Alternative 2 offers relatively little increase in overall protection of human health and the environment at AOC 11.

Alternative 4. The effectiveness of Alternative 4 is roughly similar to that of Alternative 2, with the difference being that AOCs 9 and 40 are excavated and consolidated in Alternative 4 rather than being capped. Both alternatives have significant potential to achieve acceptable risk levels for human and ecological receptors. The cost of Alternative 4 is \$16.6 million compared to \$7.6 million for Alternative 2.

Alternative 5. The effectiveness of Alternative 5 can be directly compared to Alternative 4, with the difference being that AOC 41 and SAs 6, 12, and 13 are capped in

SECTION 9

1 place in Alternative 5 rather than being subjected to no further action. This results in a
2 relatively significant increase in protection of human health and the environment for
3 Alternative 5.

4
5 **Alternative 6.** Alternative 6, the most costly of the alternatives, can be directly compared
6 to Alternative 5, with the difference being that AOC 11 is excavated and consolidated in
7 Alternative 6 rather than being subjected to limited removal. The cost of Alternative 6 is
8 \$21.6 million, compared to \$19.6 million for Alternative 5. Alternative 6 offers relatively
9 little increase in protection of human health and the environment, because the PRE did not
10 identify significant potential for human or ecological risk at AOC 11.

11
12 **Alternative 7.** At \$12.5 million, Alternative 7 offers as much protection of human health
13 and the environment as Alternative 6, which costs \$21.6 million. The capped landfills of
14 Alternative 7 would preclude the seven disposal sites from future re-use, and may impact
15 choices for re-development at Devens with regard to water supply and wastewater
16 resources.

17
18 **Alternative 8.** Because wastes at AOC 11 would undergo only surface removal,
19 Alternative 8 is considered to be less compliant with ARARs than Alternatives 7 or 9, but
20 would offer essentially the same degree of protection of human health and the
21 environment.

22
23 **Alternative 9.** Of the alternatives, Alternative 9 offers the greatest amount of former
24 landfill area to be reused, because wastes at all sites are relocated to the consolidation
25 landfill. No further environmental monitoring would be required at the seven landfills after
26 waste removal. Thus, Alternative 9 offers the least impact on water supply and
27 wastewater resources at Devens.
28

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

1	ABB-ES	ABB Environmental Services, Inc.
2	ACEC	area of critical environmental concern
3	AOC	Area of Contamination
4	ARARs	Applicable or Relevant and Appropriate Requirements
5	AREE	Area Requiring Environmental Evaluation
6	ASL	above sea level
7	AWQC	Ambient Water Quality Criteria
8		
9	BCT	BRAC Cleanup Team
10	BEHP	bis(2-ethylhexyl)phthalate
11	bgs	below ground surface
12	BRAC	Base Realignment and Closure
13		
14	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
15	CFR	Code of Federal Regulations
16	CMR	Code of Massachusetts Regulations
17	cm/sec	centimeter per second
18	COC	contaminant of concern
19	CPC	chemical of potential concern
20	cy	cubic yards
21		
22	DCA	dichloroethane
23	DDD	2,2-bis(para-chlorophenyl)-1,1-dichloroethane
24	DDE	2,2-bis(para-chlorophenyl)-1,1-dichloroethene
25	DDT	2,2-bis(para-chlorophenyl)-1,1,1-trichloroethane
26	DOT	Department of Transportation
27		
28	E&E	Ecology of Environment, Inc.
29		
30	ft	feet
31	FORSCOM	U.S. Army Forces Command
32	FS	Feasibility Study
33		
34	gpm	gallons per minute
35		
36	HI	hazard index
37		

ABB Environmental Services, Inc.

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

1	IAG	Interagency Agreement
2		
3	MADEP	Massachusetts Department of Environmental Protection
4	MCL	Maximum Contaminant Level
5	MCP	Massachusetts Contingency Plan
6	mg/L	milligrams per liter
7	MEP	Master Environmental Plan
8	MEPA	Massachusetts Environmental Protection Act
9	MGLB	Massachusetts Government Land Bank
10	MNHP	Massachusetts Natural Heritage Program
11		
12	NCP	National Oil and Hazardous Substances Pollution Contingency Plan
13	NFA	No Further Action
14	NPDES	National Pollutant Discharge Elimination System
15	NPL	National Priority List
16		
17	O&M	operations and maintenance
18	OSHA	Occupational Safety and Health Administration
19		
20	PAH	polynuclear aromatic hydrocarbon
21	PAL	Project Analyte List
22	PCB	polychlorinated biphenyl
23	POTW	publicly owned treatment works
24	PP	proposed plan
25	PRE	Preliminary Risk Evaluation
26	PRG	Preliminary Remediation Goal
27	PVC	polyvinyl chloride
28		
29	RCRA	Resource Conservation and Recovery Act
30	RfD	reference dose
31	RFTA	Reserve Forces Training Area
32	RI	Remedial Investigation
33	ROD	Record of Decision
34		
35	SA	Study Area
36	SARA	Superfund Amendments and Reauthorization Act
37	SEA	SEA Consultants

ABB Environmental Services, Inc.

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

1	sf	square feet
2	SHL	Shepley's Hill Landfill
3	SI	Site Investigation
4	SMCL	Secondary Maximum Contaminant Level
5	SSI	Supplemental Site Investigation
6	SVOC	semivolatile organic compound
7		
8	TAL	Target Analyte List
9	TBC	to-be-considered
10	TCL	Target Compound List
11	TCLP	Toxicity Characteristic Leachate Procedure
12	TPHC	total petroleum hydrocarbon compounds
13	TSS	total suspended solids
14		
15	µg/g	micrograms per gram
16	µg/L	micrograms per liter
17	USACE	U.S. Army Corps of Engineers
18	USAEC	U.S. Army Environmental Center
19	USAEHA	U.S. Army Environmental Hygiene Agency
20	USEPA	U.S. Environmental Protection Agency
21	USFWS	U.S. Fish and Wildlife Service
22	USGS	U.S. Geological Survey
23	UXO	unexploded ordinance
24		
25	VOC	volatile organic compound
26		
27	WRS	Wetland Restoration Specification
28		

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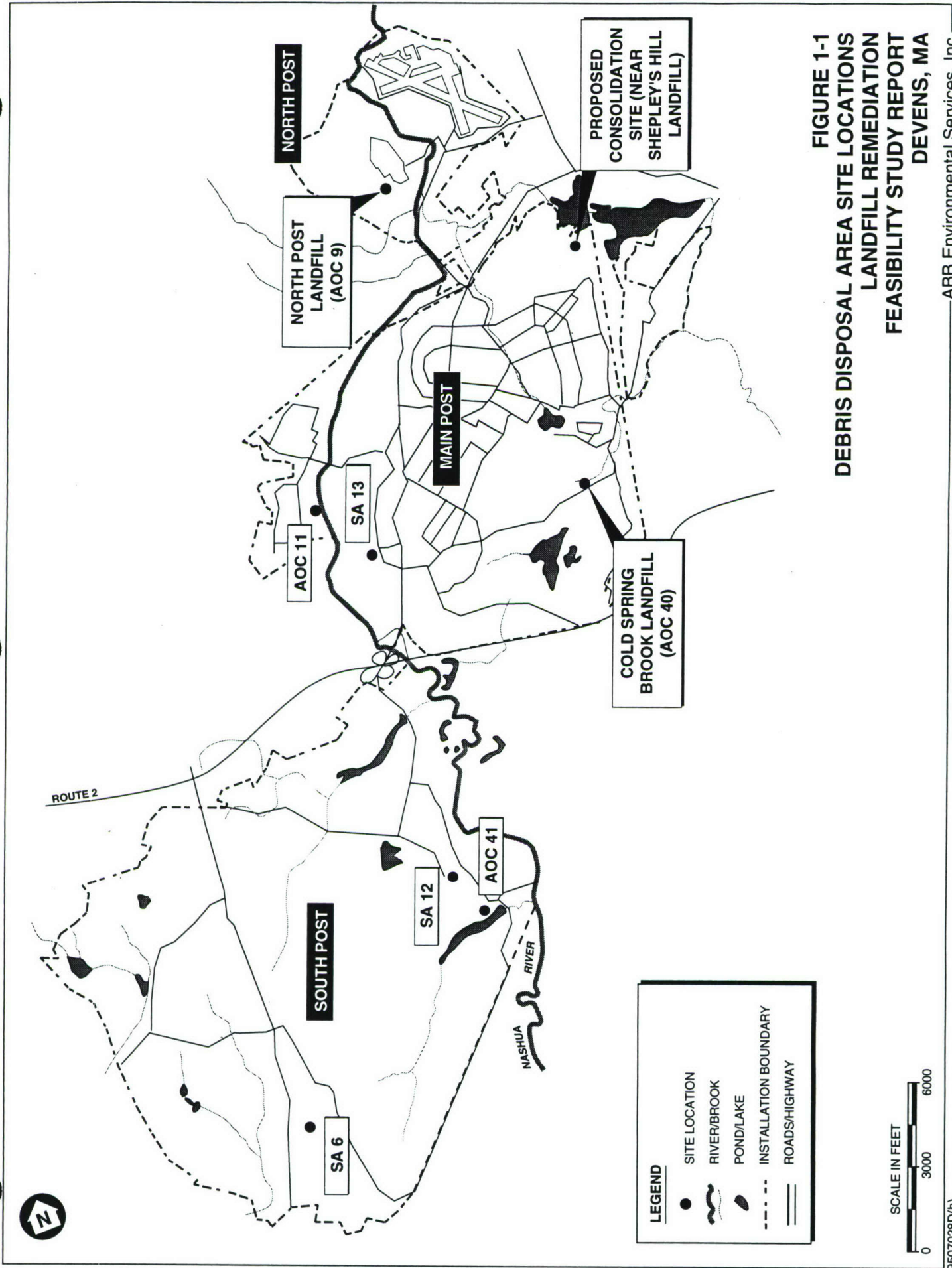


FIGURE 1-1
DEBRIS DISPOSAL AREA SITE LOCATIONS
LANDFILL REMEDIATION
FEASIBILITY STUDY REPORT
DEVENS, MA

SCALE IN FEET
 0 3000 6000

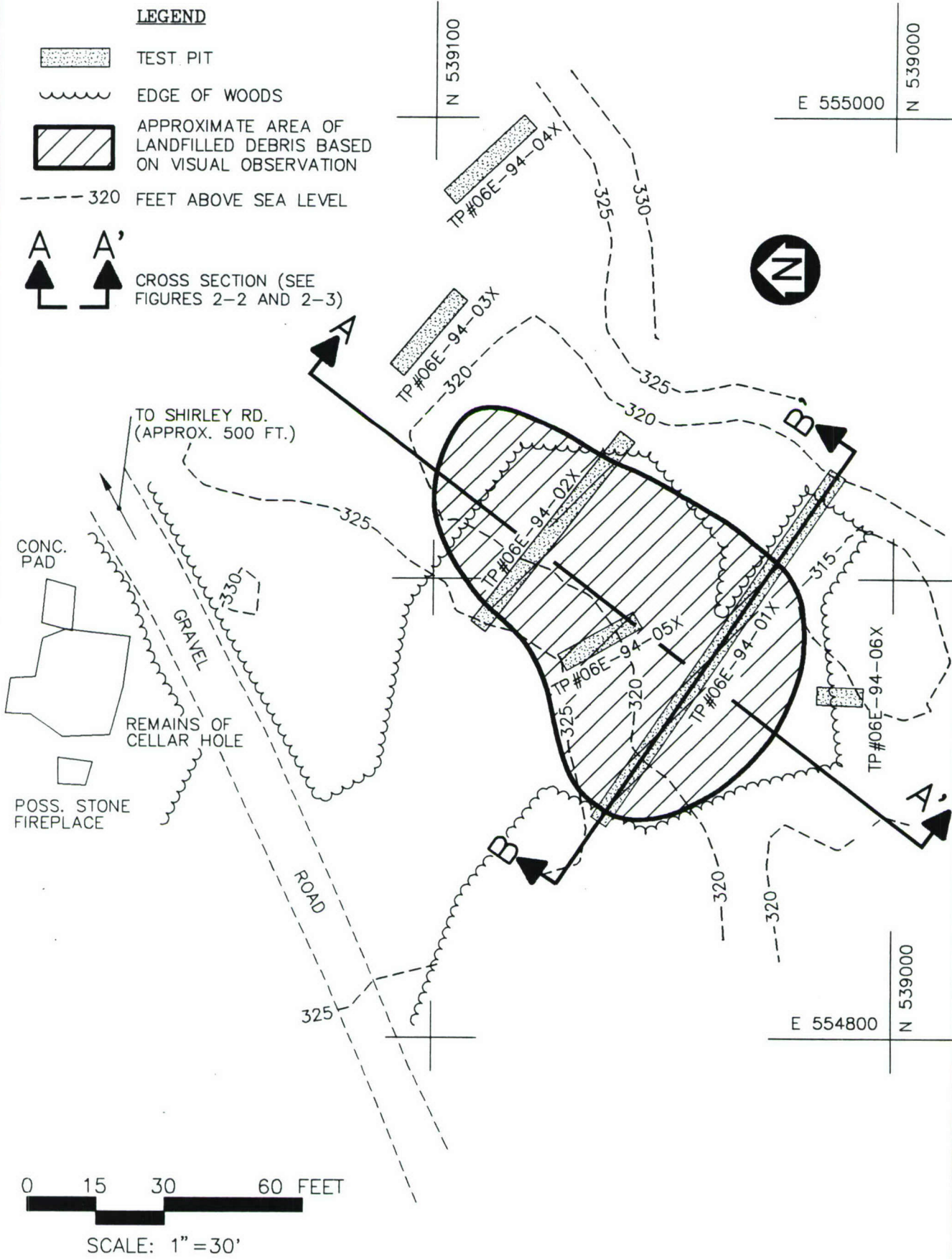
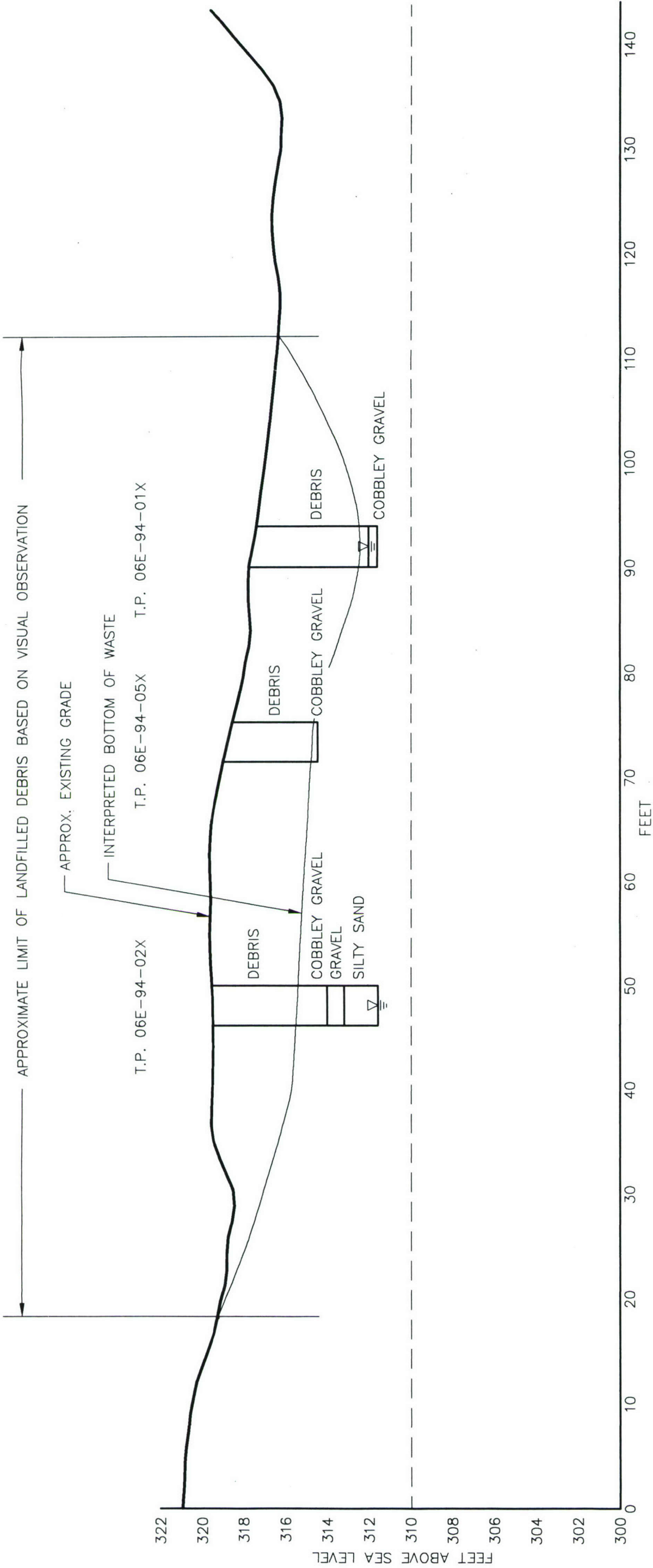


FIGURE 2-1
 SA 6 SITE PLAN
 LANDFILL REMEDIATION FEASIBILITY STUDY
 DEVENS, MA
 ABB Environmental Services, Inc.

J:\8712-04\8712F013.DWG 1"=30' 1/07/97



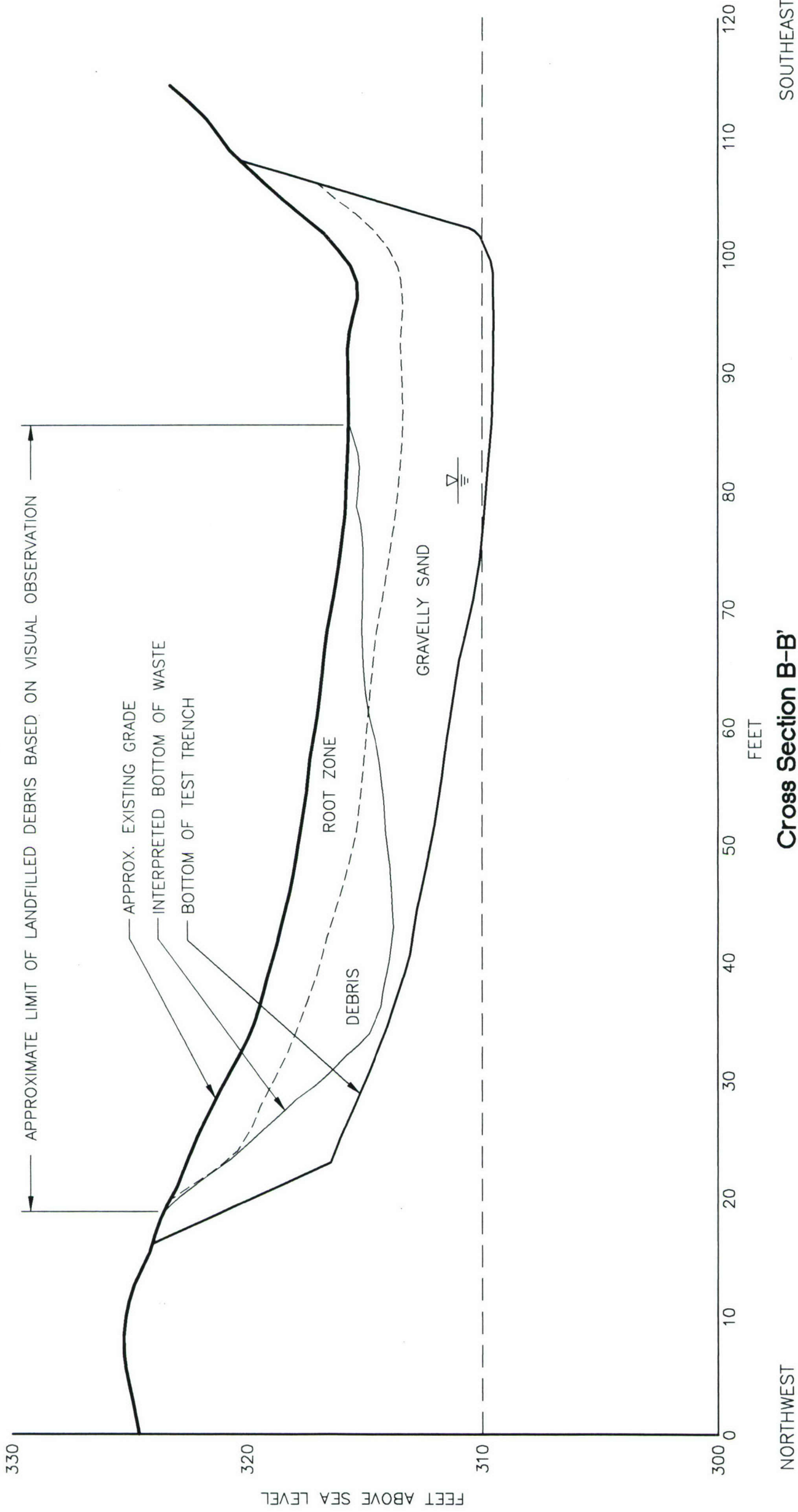
Cross Section A-A'



SCALE: 1" = 10' HORIZONTAL
SCALE: 1" = 5' VERTICAL

NOTE:

1. GEOLOGY BASED ON TEST TRENCH LOGS.
2. SEE FIGURE 2-1 FOR CROSS SECTION ORIENTATION.
3. T.P. = TEST PIT



0 5 10 20 FEET
SCALE: 1"=10' HORIZONTAL
SCALE: 1"=5' VERTICAL

NOTES:

1. THIS CROSS-SECTION HAS BEEN CUT ALONG THE CENTERLINE OF TP#06E-94-01X.
2. GEOLOGIC DESCRIPTIONS BASED ON TEST TRENCH LOGS.
3. SEE FIGURE 2-1 FOR CROSS SECTION ORIENTATION.

J:\8712-04\8712F015.DWG 1"=10' 1/07/97

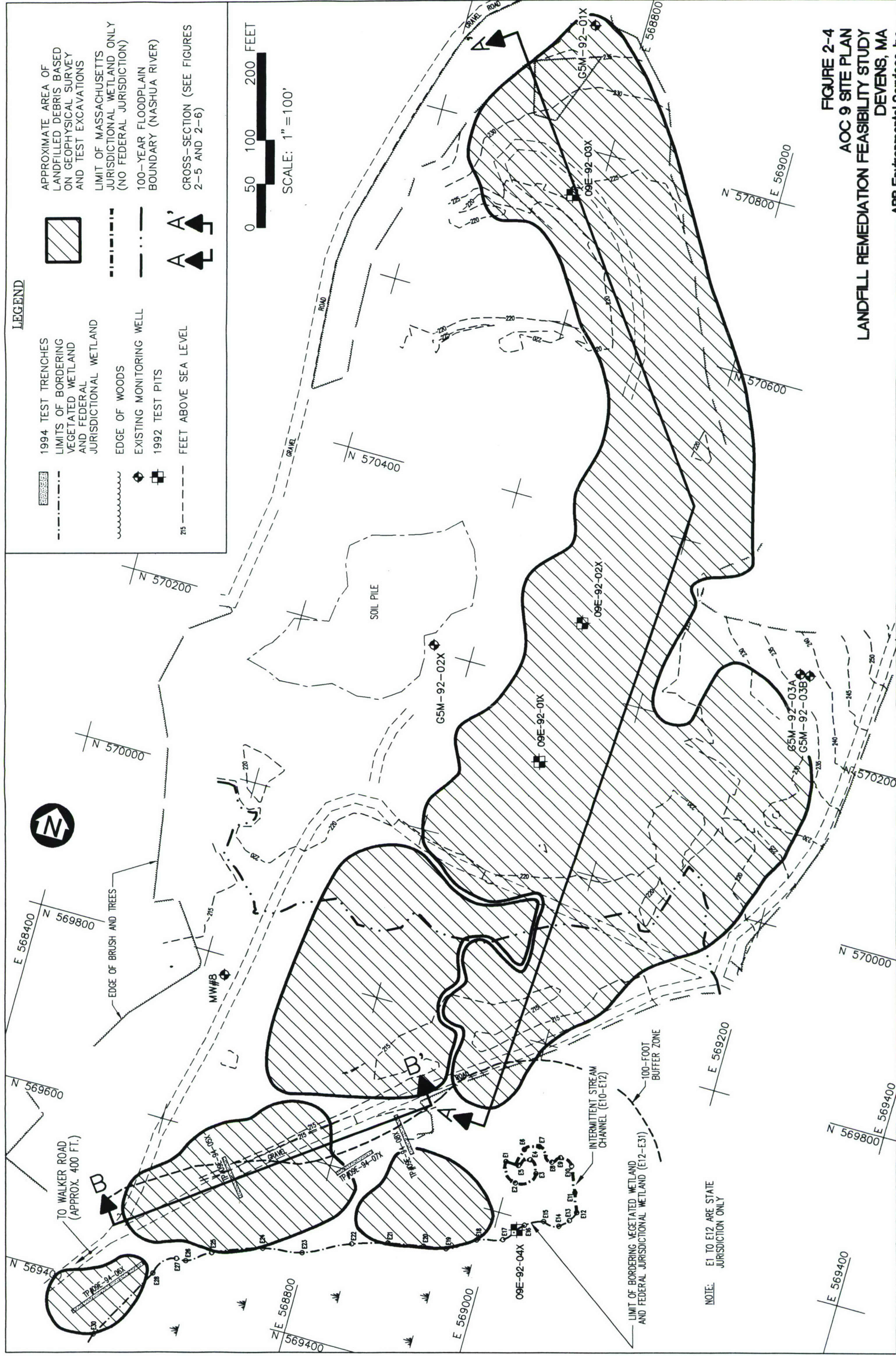
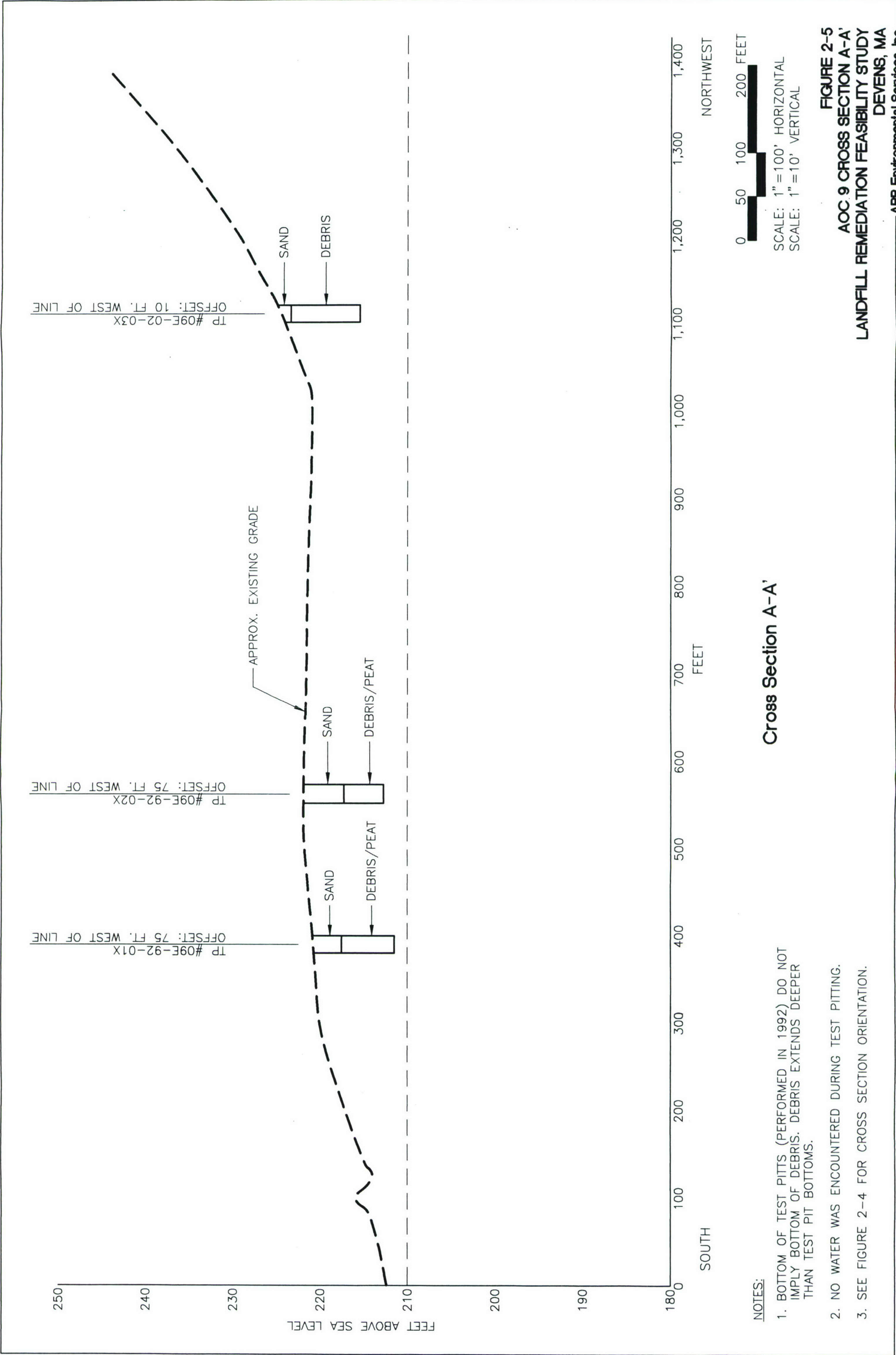
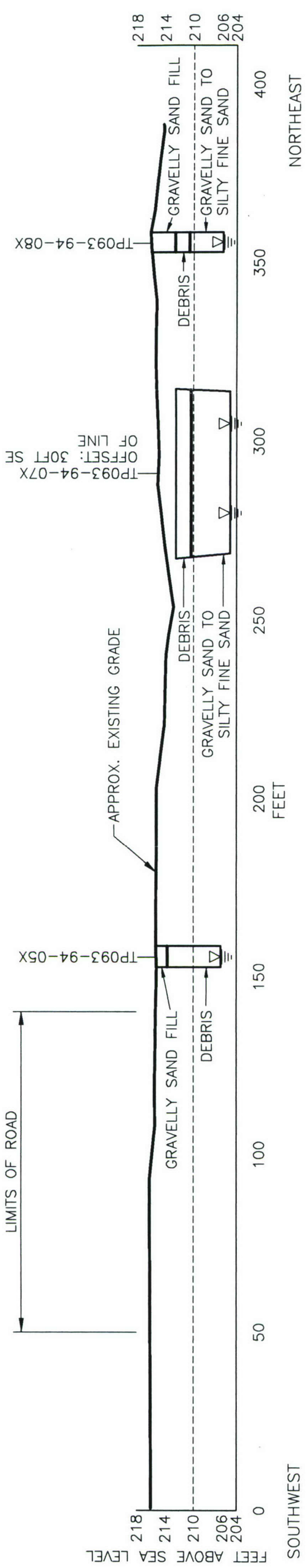


FIGURE 2-4
AOC 9 SITE PLAN
LANDFILL REMEDIATION FEASIBILITY STUDY
DEVENS, MA
____ ABB Environmental Services, Inc.

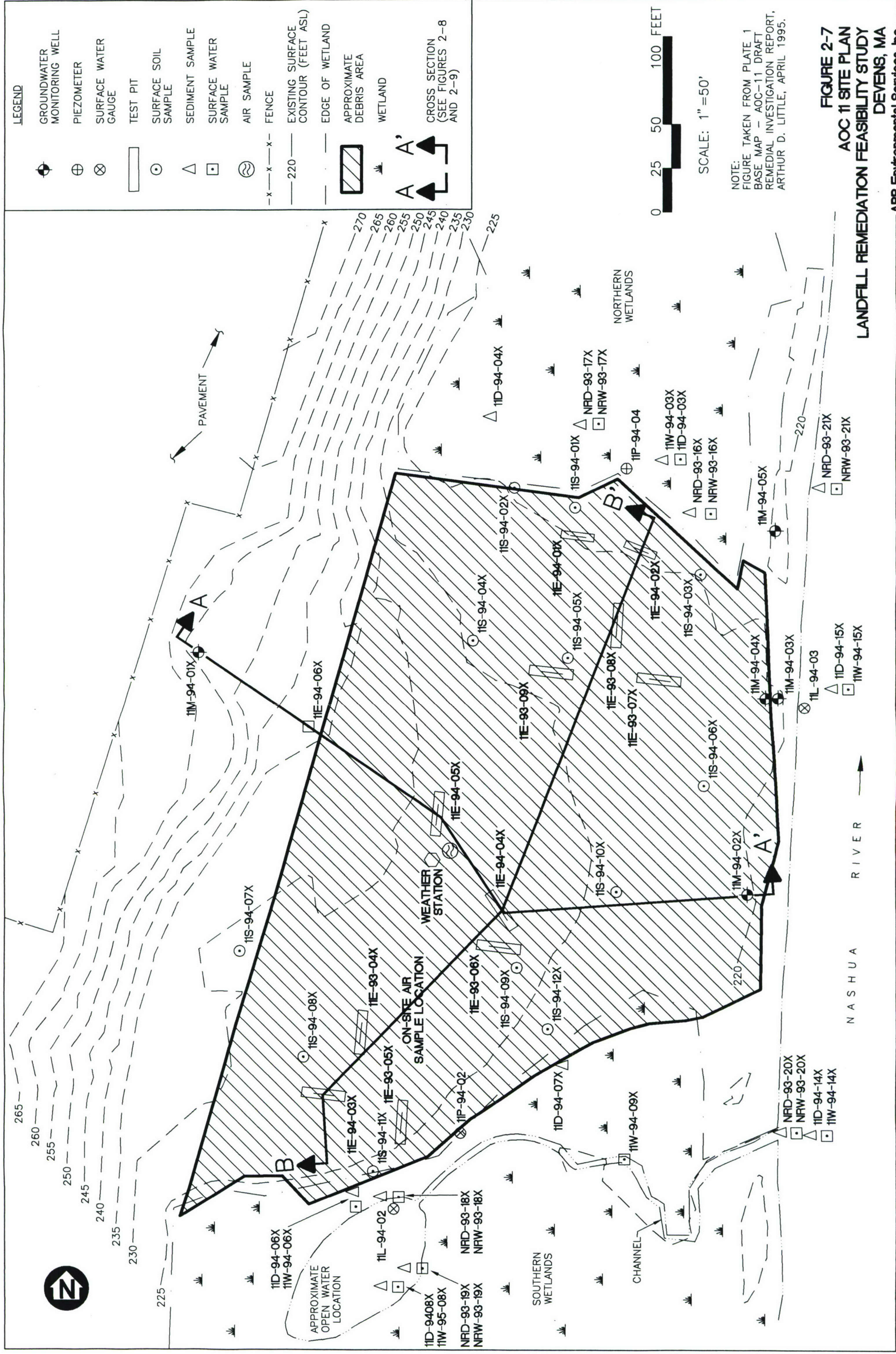


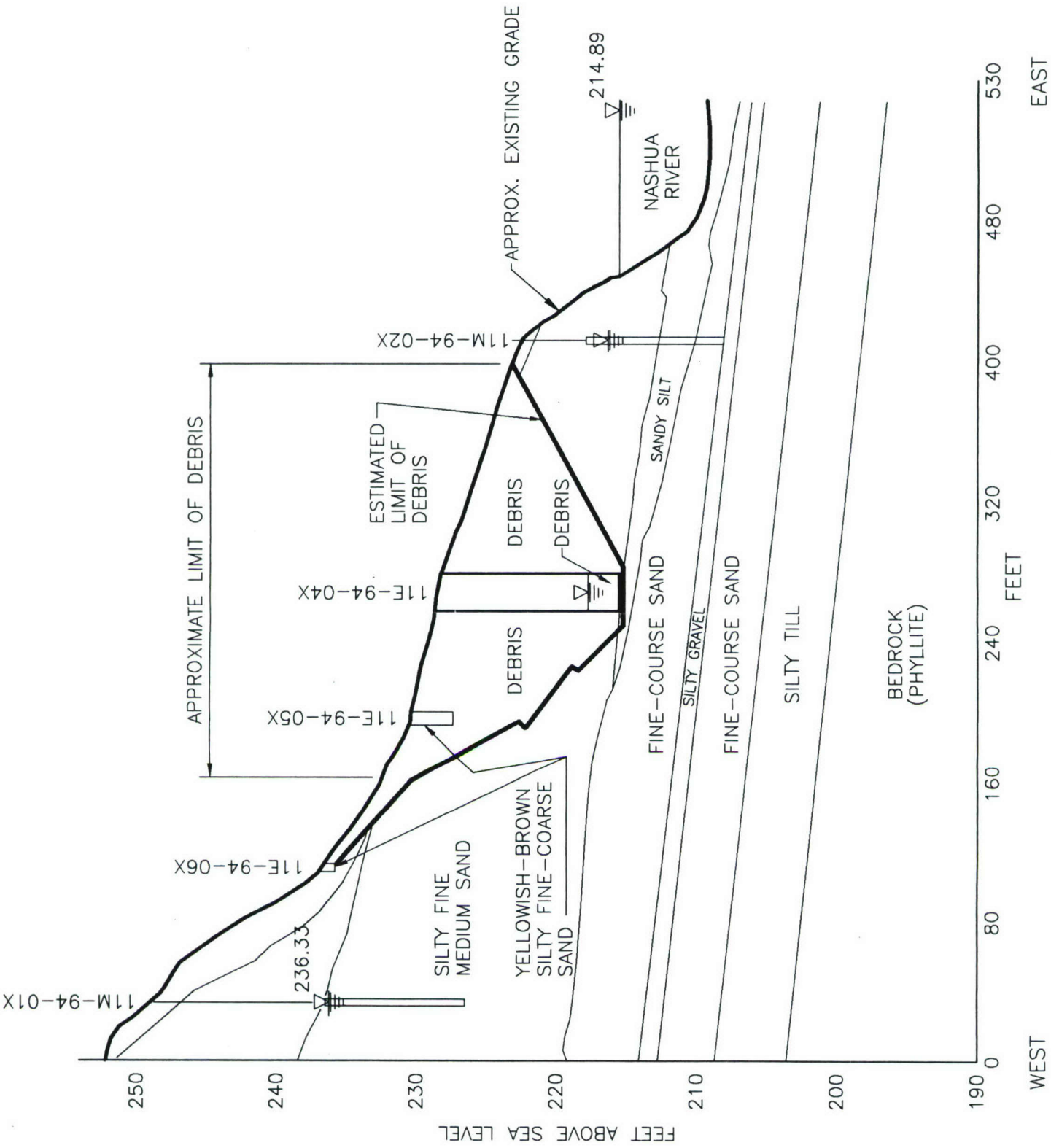


Cross Section B-B'



- NOTES:
- 1. BOTTOM OF DEBRIS INTERPOLATED FROM TEST TRENCH LOGS DOCUMENTING EXCAVATIONS PERFORMED IN 1994.
 - 2. SEE FIGURE 2-4 FOR CROSS SECTION ORIENTATION.

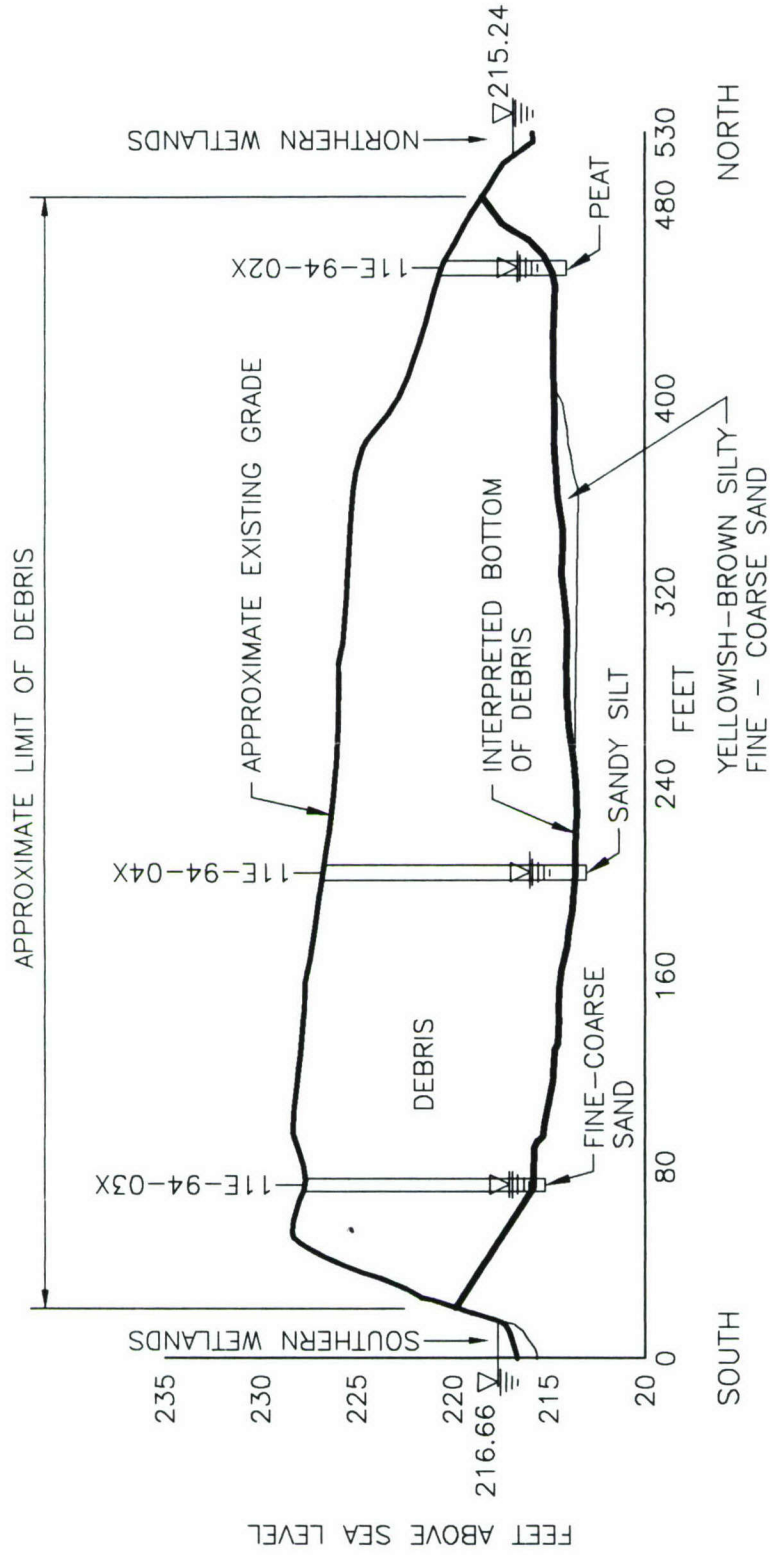




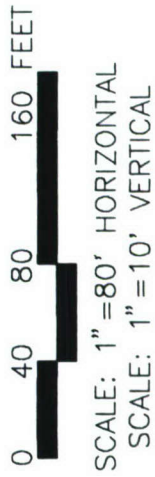
Cross Section A-A'

0 40 80 160 FEET
 SCALE: 1"=80' HORIZONTAL
 SCALE: 1"=10' VERTICAL

- NOTES:
1. GEOLOGIC DESCRIPTIONS BASED ON TEST PIT LOGS.
 2. CROSS SECTION TAKEN FROM FIGURE 3-2, DRAFT RI REPORT, ARTHUR D. LITTLE, APRIL 1995.
 3. SEE FIGURE 2-7 FOR CROSS SECTION ORIENTATION.

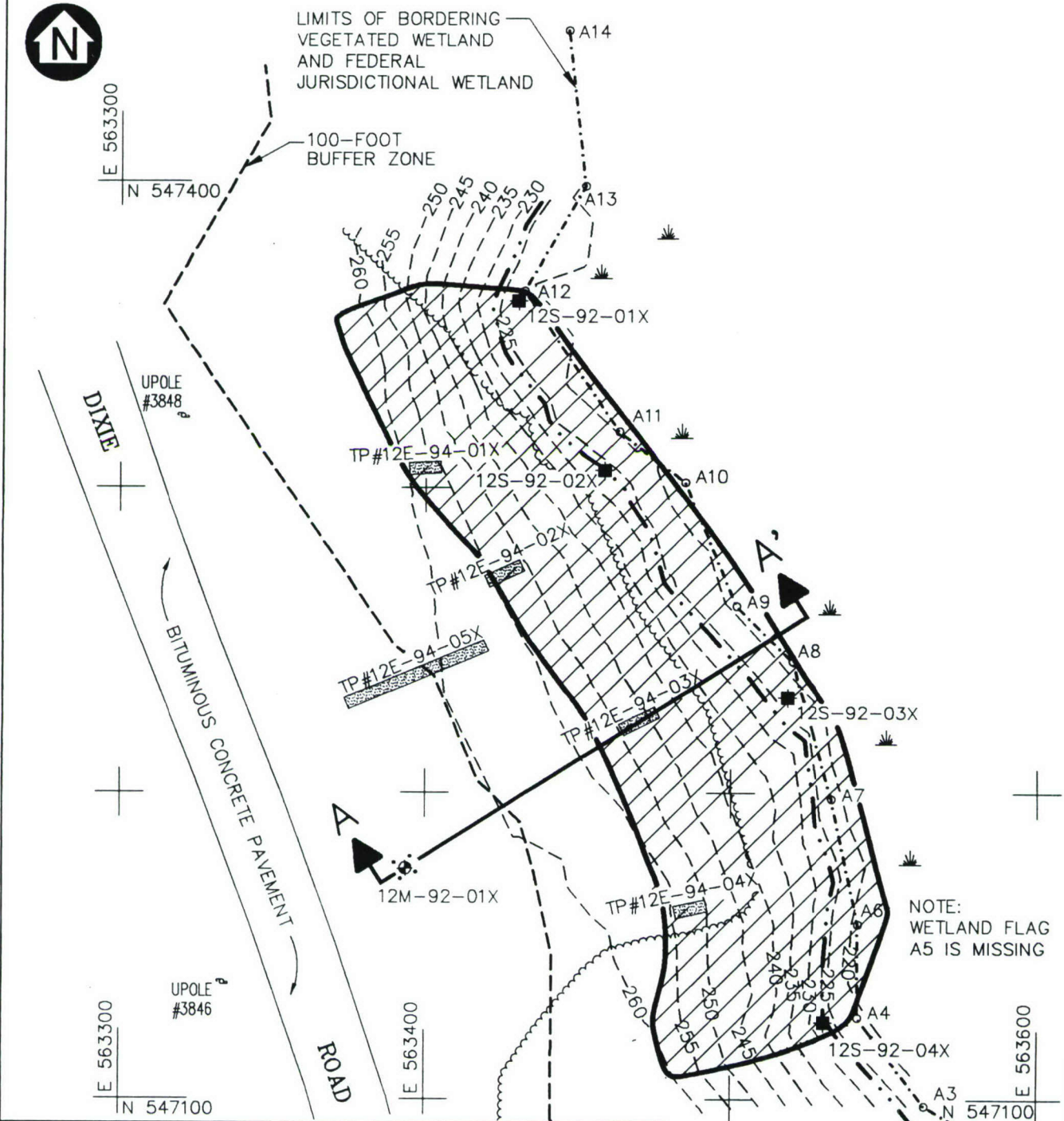


Cross Section B-B'



NOTES:

1. GEOLOGIC DESCRIPTIONS BASED ON TEST PIT LOGS.
2. CROSS SECTION TAKEN FROM FIGURE 3-3, DRAFT RI REPORT, AUTHUR D. LITTLE, APRIL 1995.
3. SEE FIGURE 2-7 FOR CROSS SECTION ORIENTATION.



LEGEND

- | | | | |
|--|---|--|---|
| | TEST PIT | | WETLAND |
| | LIMITS OF BORDERING
VEGETATED WETLAND
AND FEDERAL
JURISDICTIONAL WETLAND | | 100 YEAR FLOODPLAIN
BOUNDARY
(NASHUA RIVER) |
| | EDGE OF WOODS | | SURFACE SOIL
SAMPLE LOCATION |
| | UTILITY POLE | | CROSS SECTION
(SEE FIGURE 2-11) |
| | MONITORING WELL
WITH BOLLARDS | | |
| | APPROXIMATE AREA OF
LANDFILLED DEBRIS BASED
ON VISUAL OBSERVATION | | |
- 260 -- FEET ABOVE SEA LEVEL

LIMITS OF BORDERING
VEGETATED WETLAND
AND FEDERAL
JURISDICTIONAL WETLAND

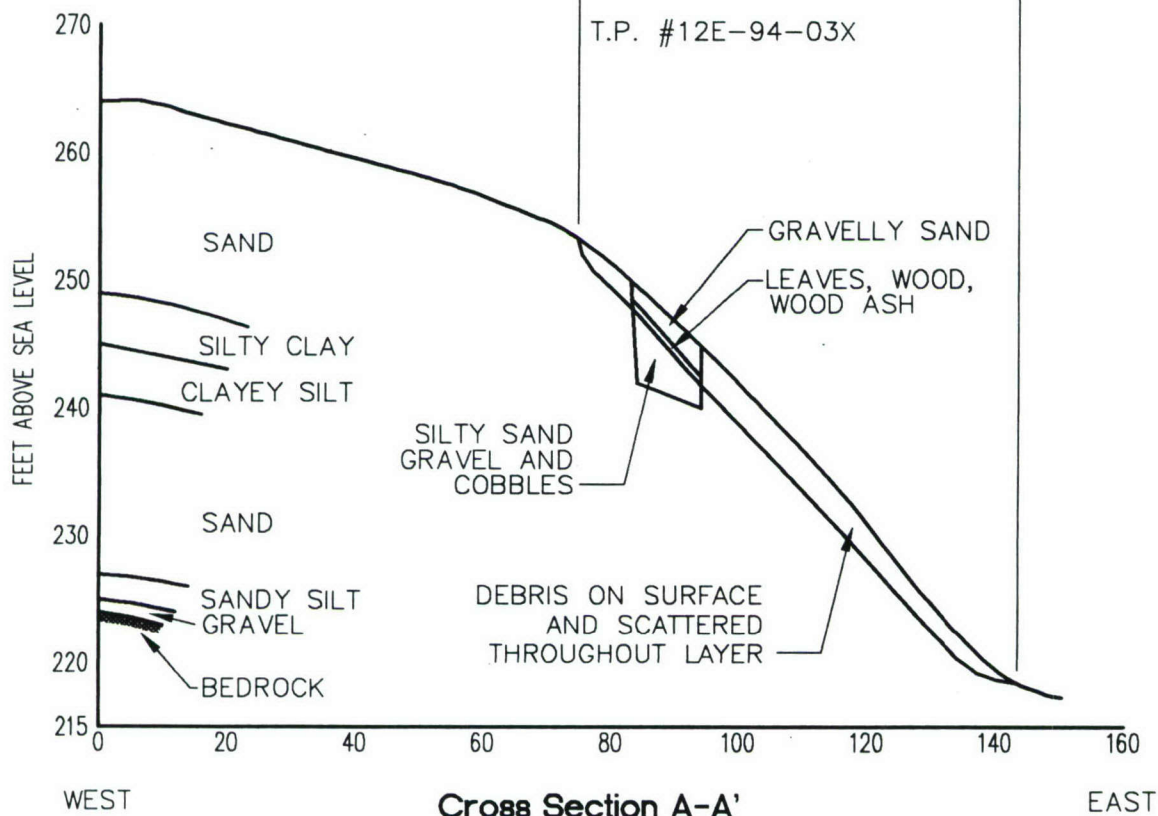
0 25 50 100 FEET

SCALE: 1"=50'

FIGURE 2-10
SA 12 SITE PLAN
LANDFILL REMEDIATION FEASIBILITY STUDY
DEVENS, MA

ABB Environmental Services, Inc.

GROUNDWATER
MONITORING WELL NO.
12M-92-01X



NOTES:

1. GEOLOGIC DESCRIPTIONS ARE BASED ON BORING AND TEST PIT LOGS.
2. DEPTH OF DEBRIS INTERPRETED FROM TEST PIT LOGS.
3. SEE FIGURE 2-10 FOR CROSS SECTION ORIENTATION.
4. T.P. = TEST PIT

0 15 30 60 FEET

SCALE: 1"=30' HORIZONTAL

SCALE: 1"=15' VERTICAL

FIGURE 2-11
SA 12 CROSS SECTION A-A'
LANDFILL REMEDIATION FEASIBILITY STUDY
DEVENS, MA

ABB Environmental Services, Inc.

J:\8712-04\8712F024.DWG 1"=50' 1/28/97

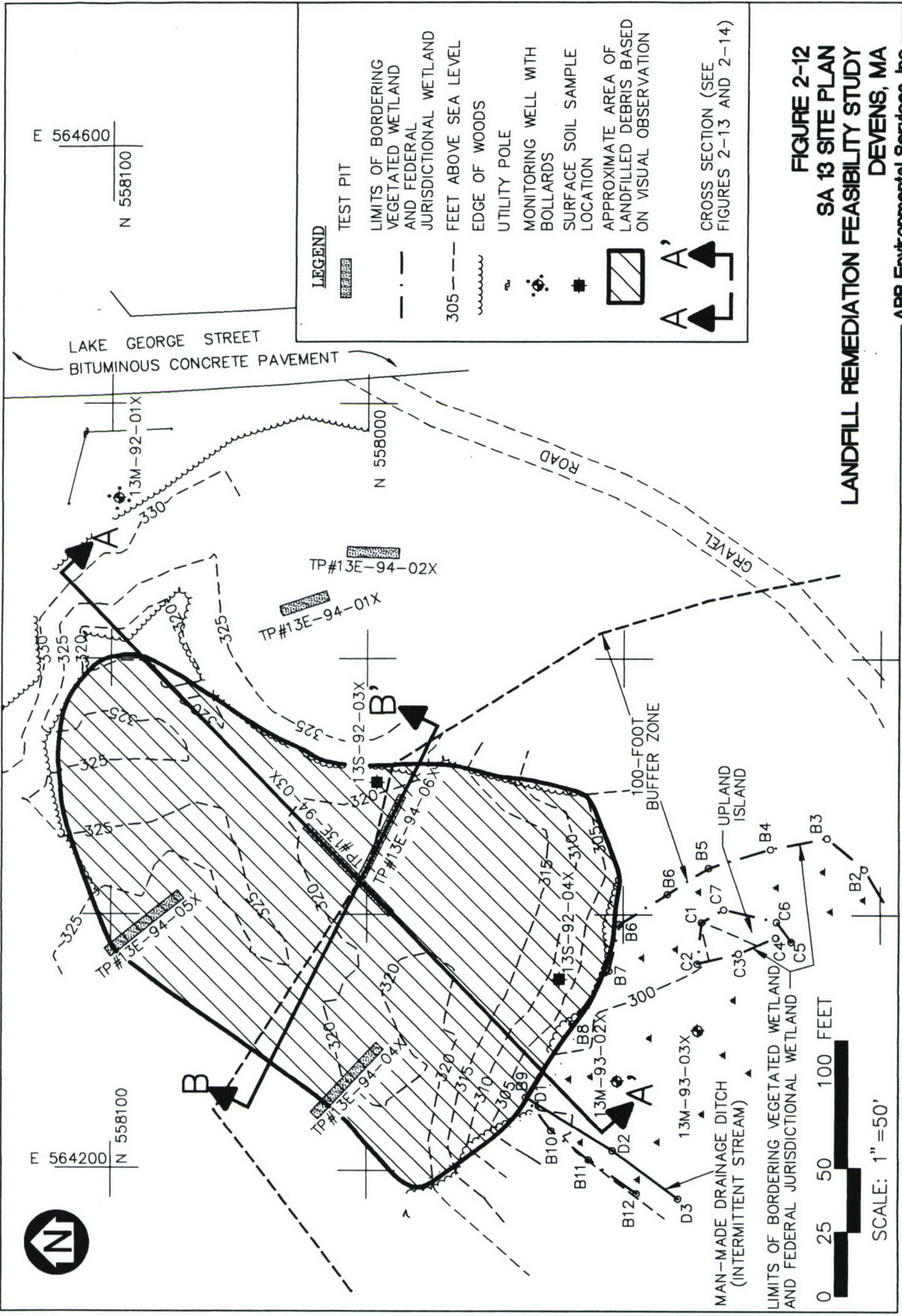
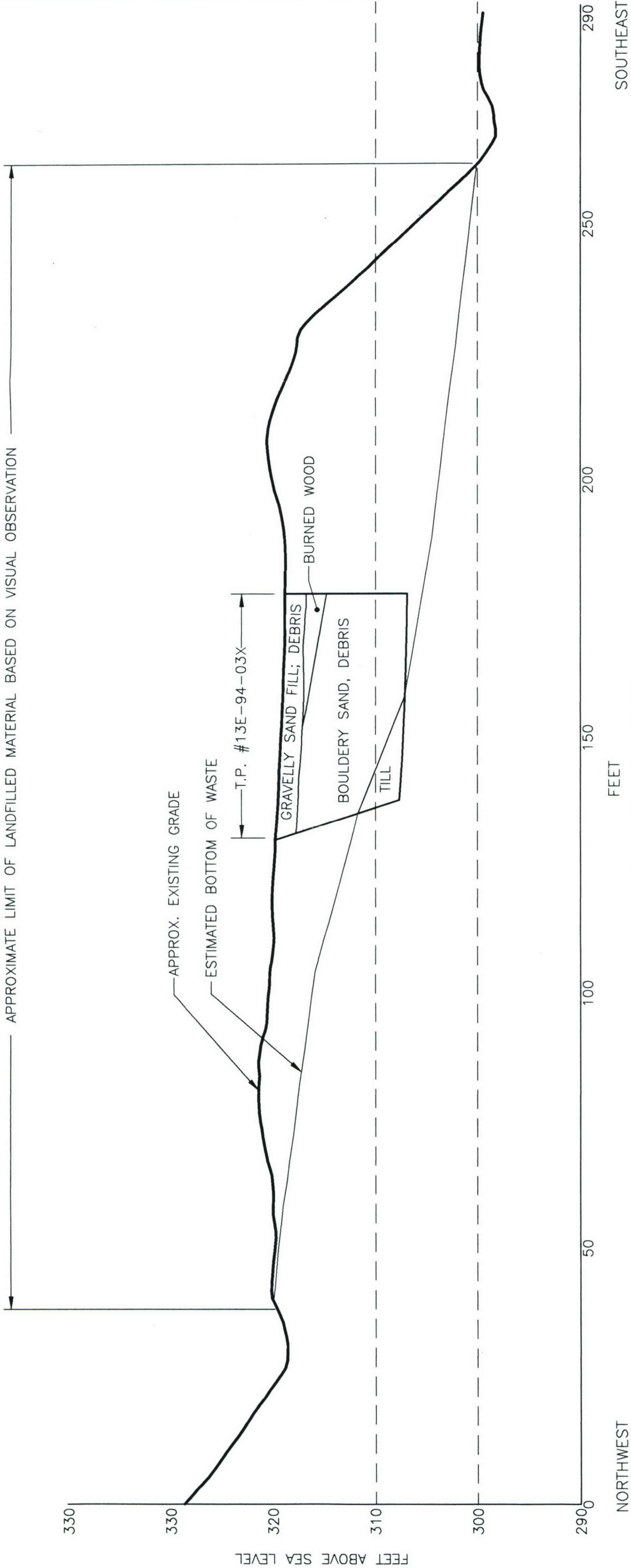


FIGURE 2-12
SA 13 SITE PLAN
LANDFILL REMEDIATION FEASIBILITY STUDY
DEVENS, MA
ABB Environmental Services, Inc.

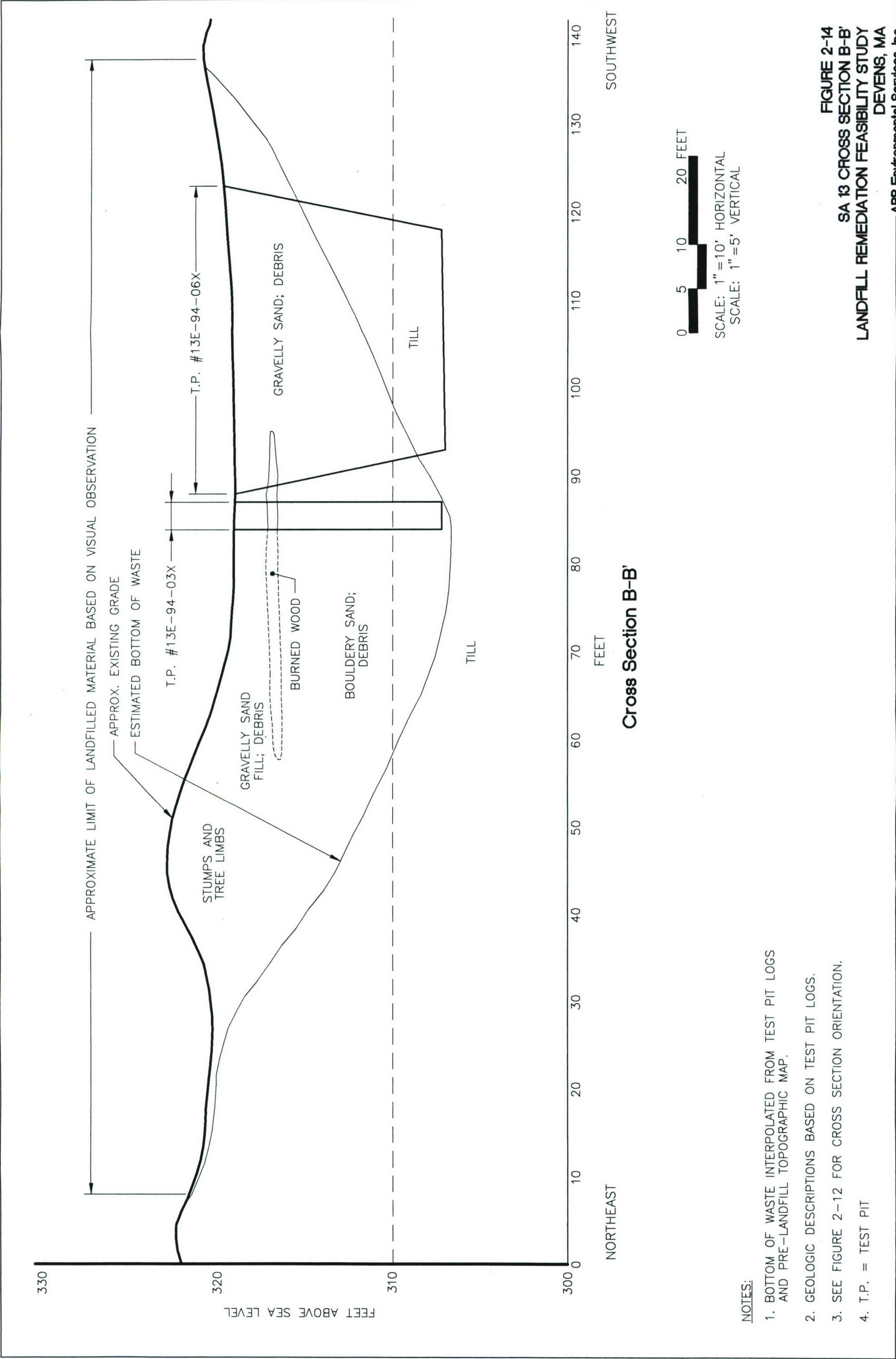


0 10 20 40 FEET

SCALE: 1"=20' HORIZONTAL
SCALE: 1"=10' VERTICAL

NOTES:

1. BOTTOM OF WASTE INTERPOLATED FROM TEST PIT LOGS AND PRE-LANDFILL TOPOGRAPHIC MAP.
2. GEOLOGIC DESCRIPTIONS BASED ON TEST PIT LOGS.
3. SEE FIGURE 2-12 FOR CROSS SECTION ORIENTATION.
4. T.P. = TEST PIT



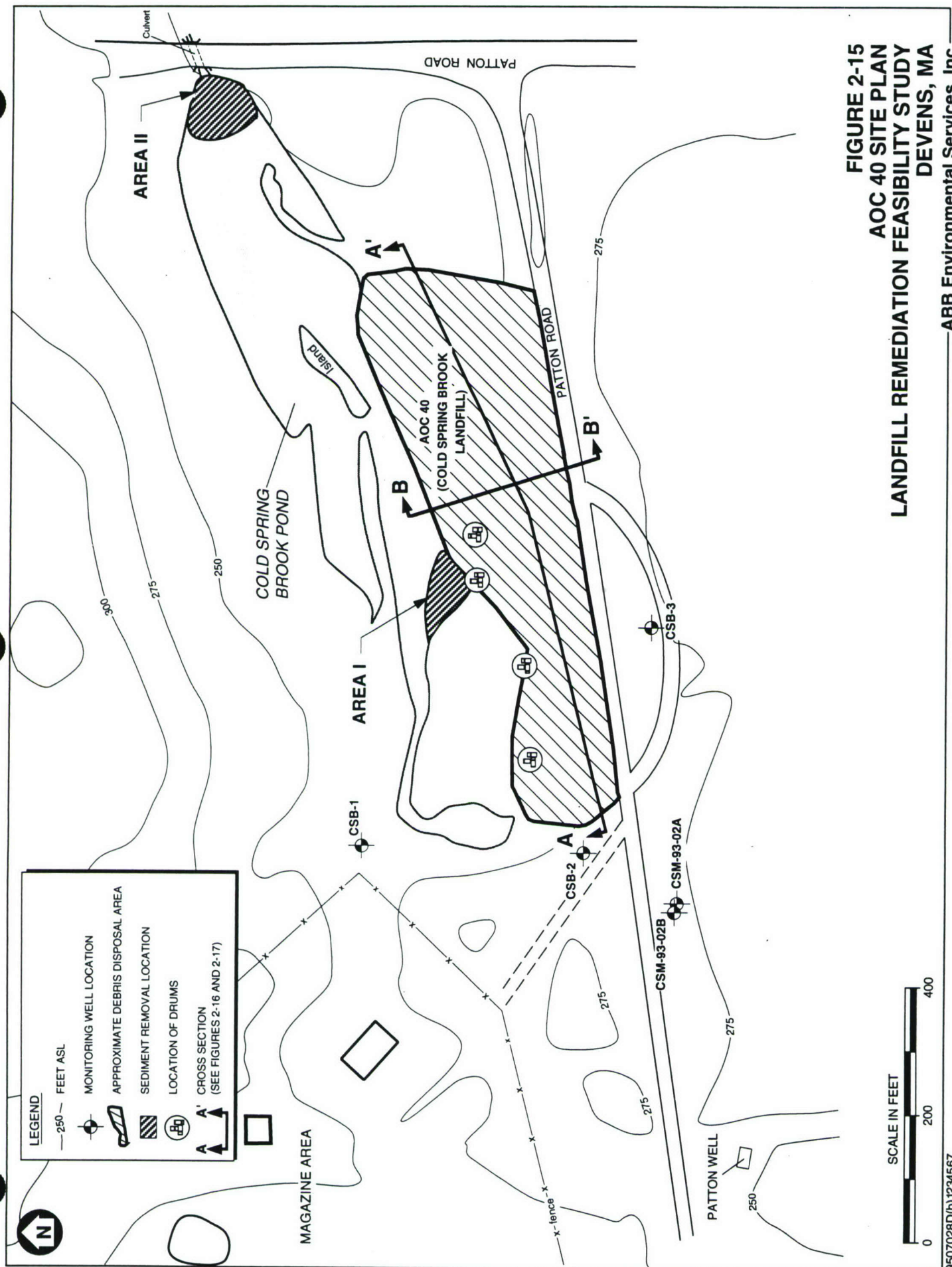
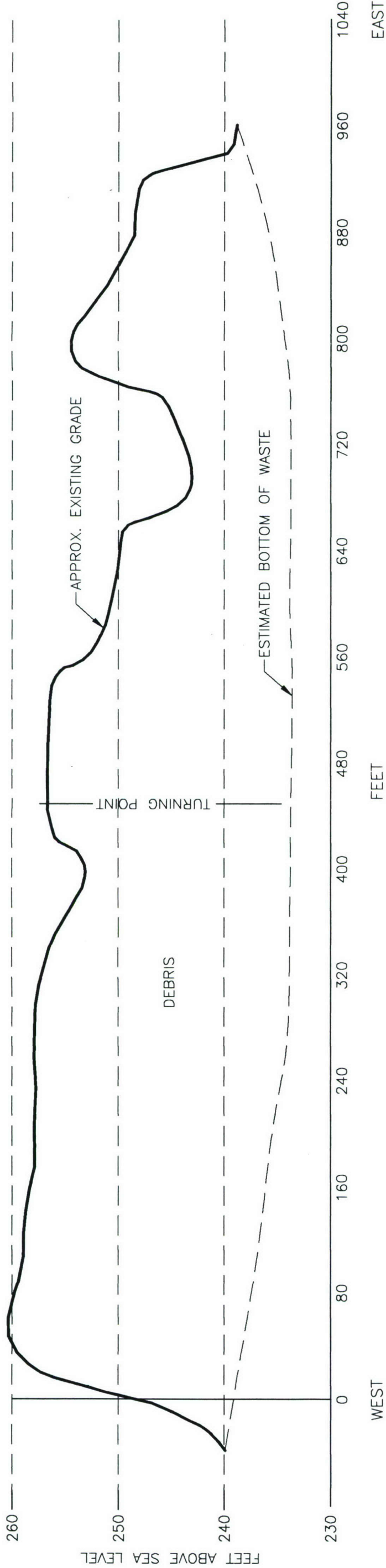
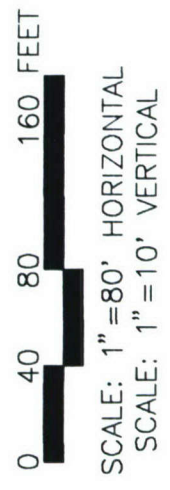


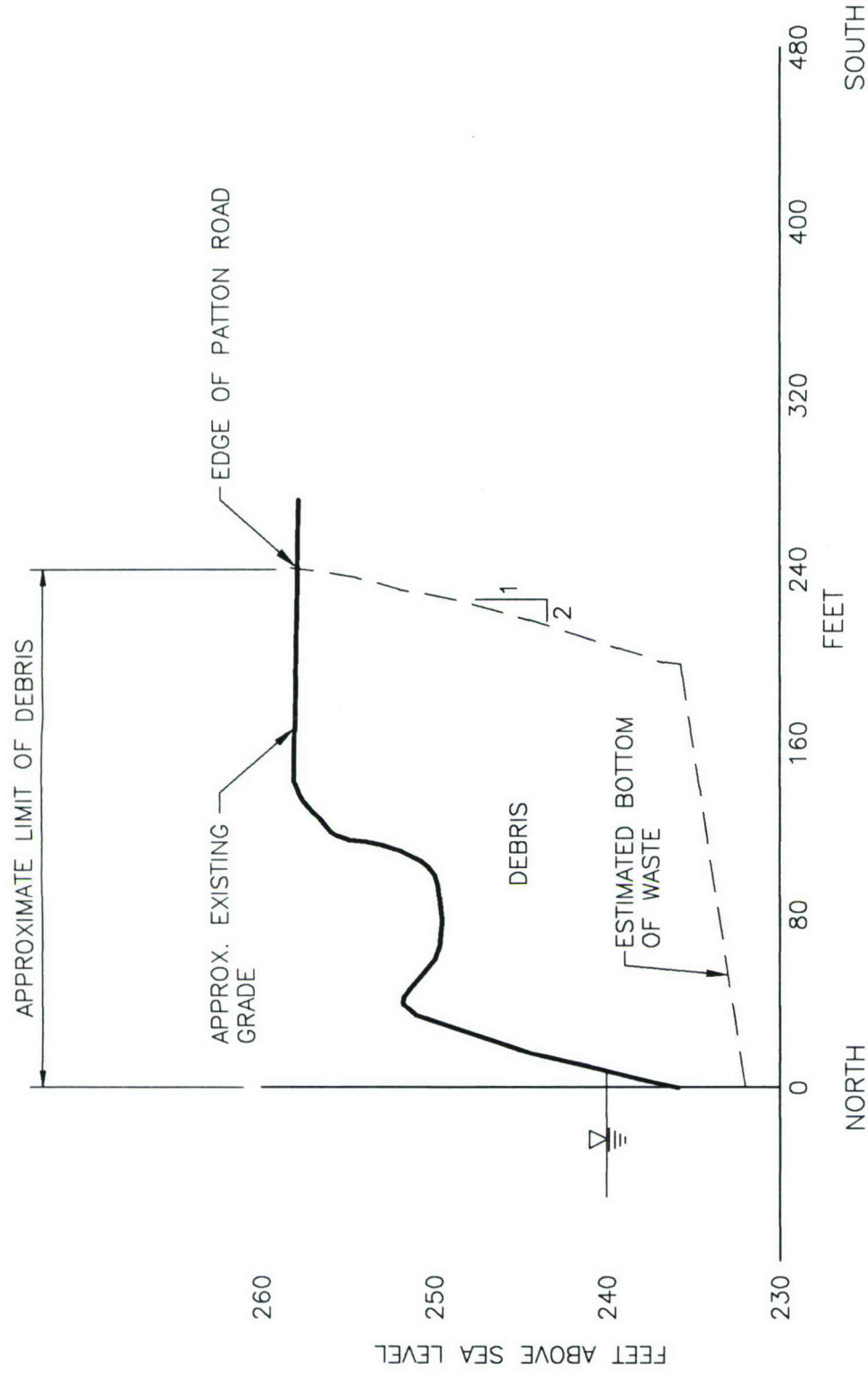
FIGURE 2-15
AOC 40 SITE PLAN
LANDFILL REMEDIATION FEASIBILITY STUDY
DEVENS, MA
 ABB Environmental Services, Inc.



Cross Section A-A'



- NOTES:
- 1. BOTTOM OF WASTE IS ESTIMATED BASED ON ELEVATIONS FROM SEA CONSULTANTS, INC. TEST PIT LOGS.
 - 2. SEE FIGURE 2-15 FOR CROSS SECTION ORIENTATION.

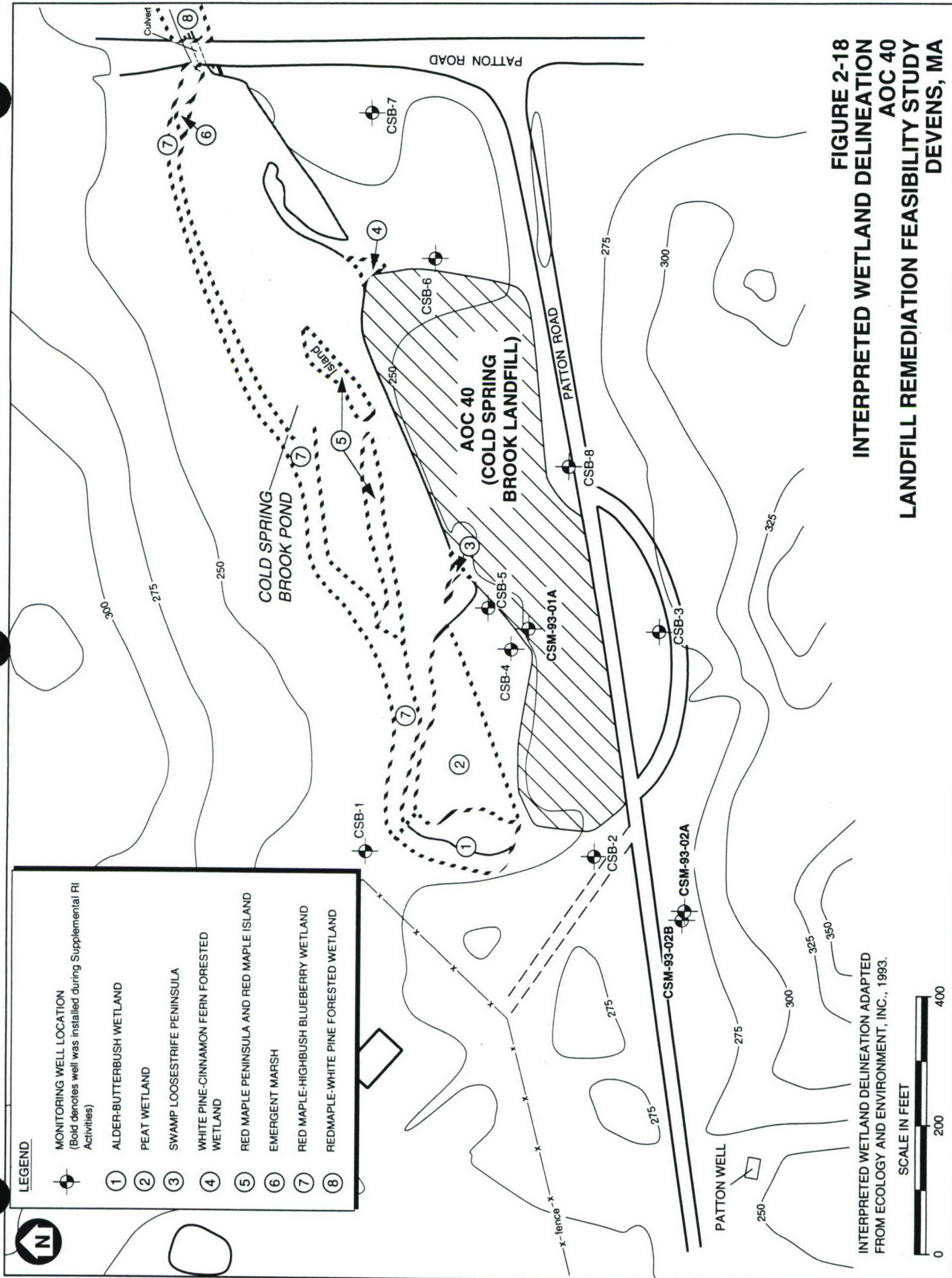


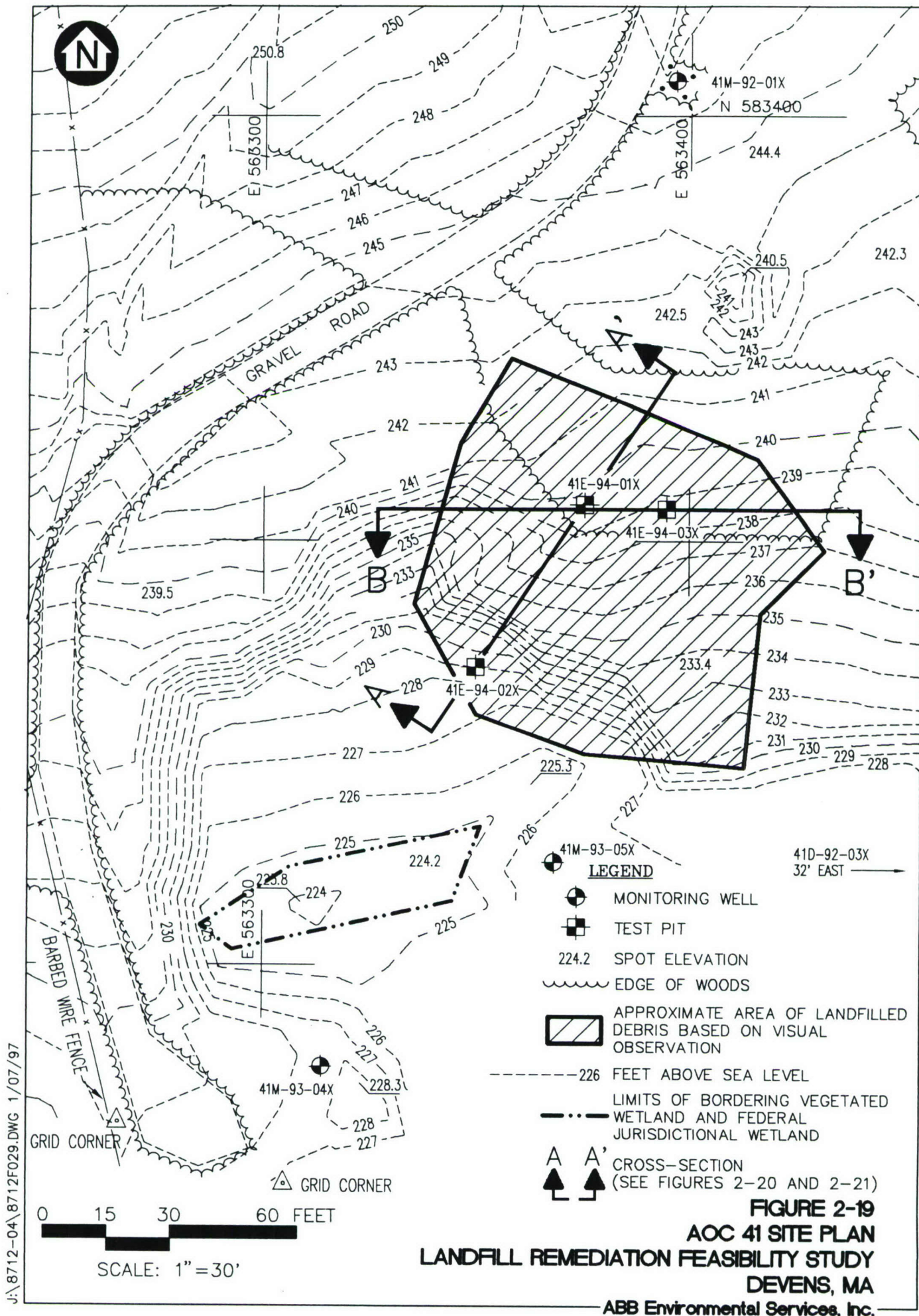
Cross Section B-B'

0 40 80 160 FEET
 SCALE: 1"=80' HORIZONTAL
 SCALE: 1"=10' VERTICAL

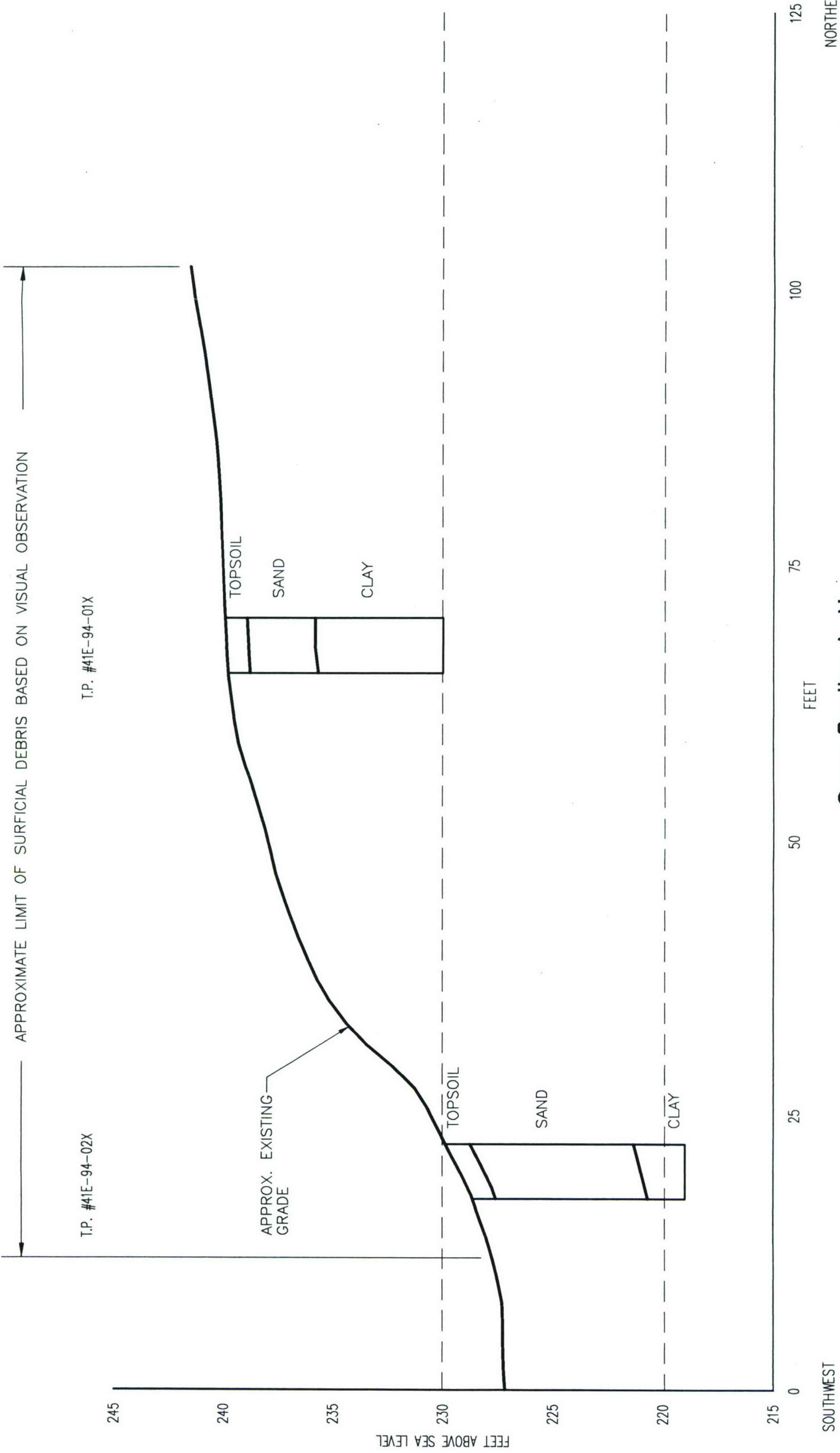
NOTES:

1. BOTTOM OF WASTE IS ESTIMATED BASED ON ELEVATIONS FROM SEA CONSULTANTS, INC. TEST PIT LOGS, AND THAT NO DEBRIS IS BENEATH PATTON ROAD.
2. SEE FIGURE 2-15 FOR CROSS SECTION ORIENTATION.





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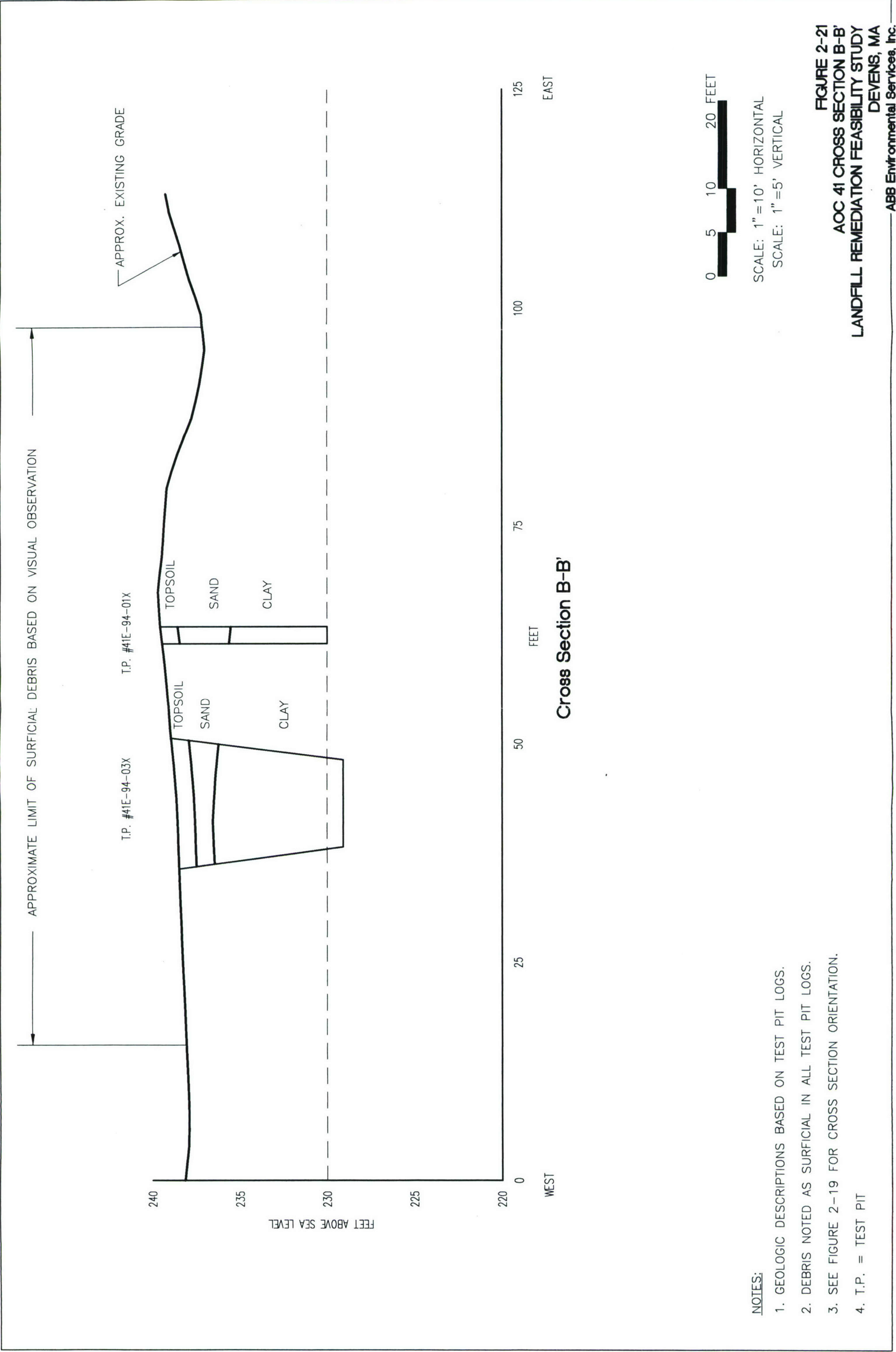


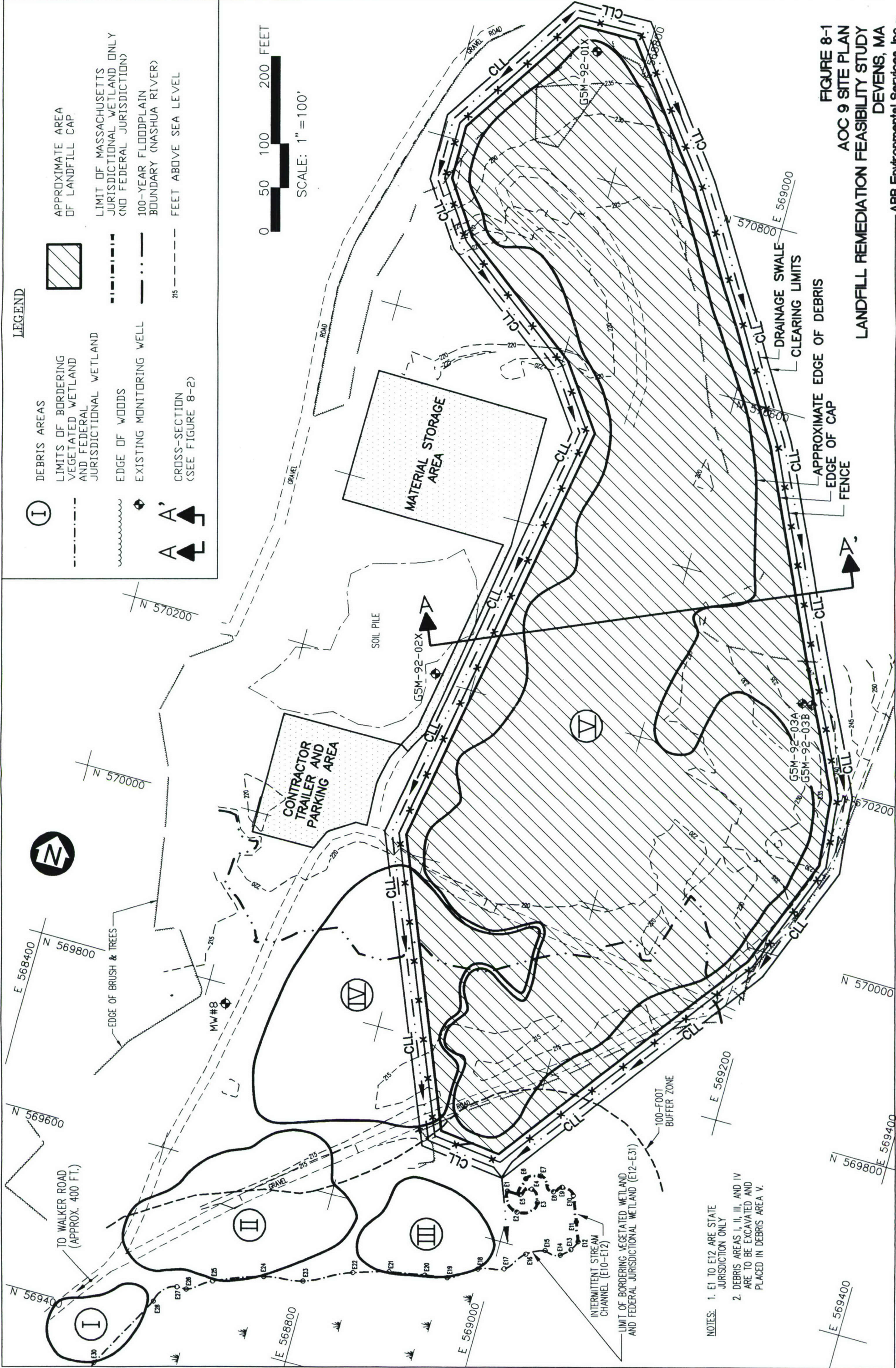
Cross Section A-A'

0 5 10 20 FEET

SCALE: 1" = 10' HORIZONTAL
SCALE: 1" = 5' VERTICAL

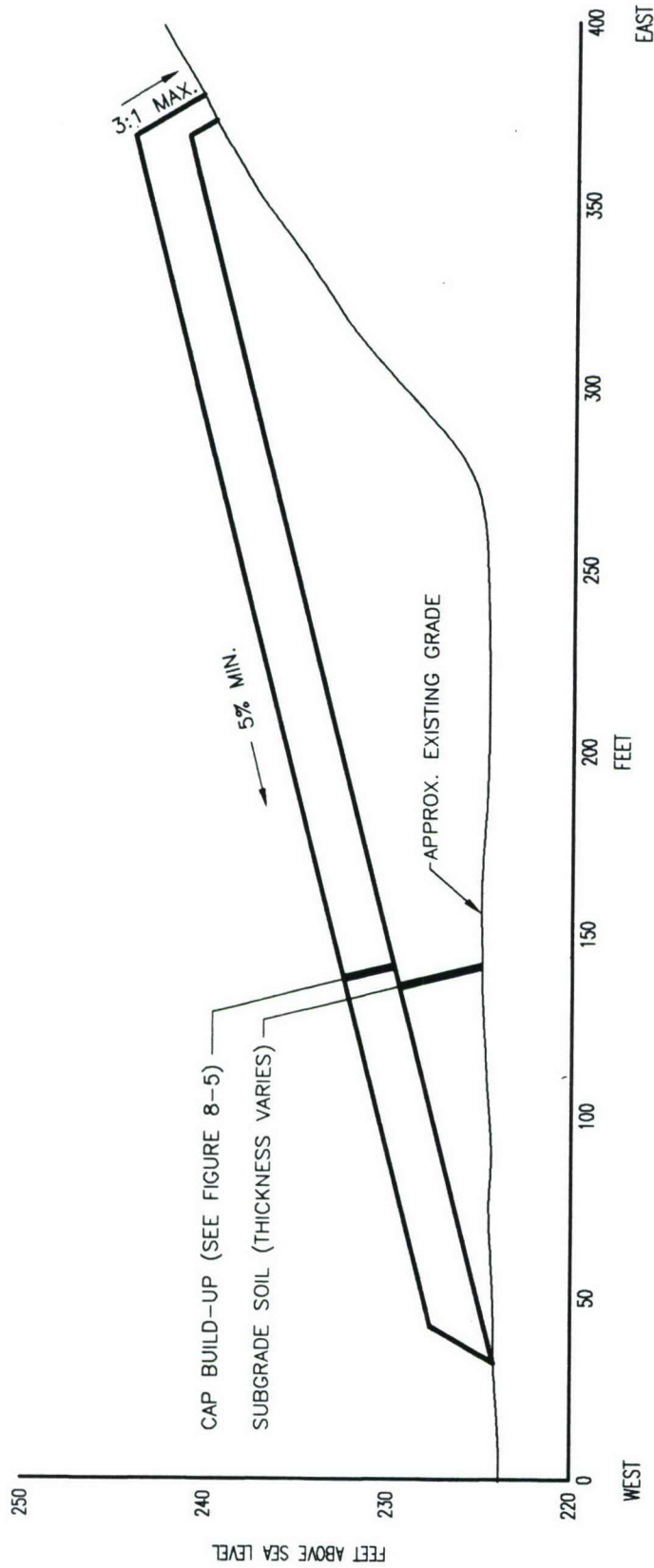
- NOTES:
- 1. GEOLOGIC DESCRIPTIONS BASED ON TEST PIT LOGS.
 - 2. DEBRIS NOTED AS SURFICIAL IN ALL TEST PIT LOGS.
 - 3. SEE FIGURE 2-19 FOR CROSS SECTION ORIENTATION.
 - 4. T.P. = TEST PIT





- NOTES:
1. E1 TO E12 ARE STATE JURISDICTION ONLY
 2. DEBRIS AREAS I, II, III, AND IV ARE TO BE EXCAVATED AND PLACED IN DEBRIS AREA V.

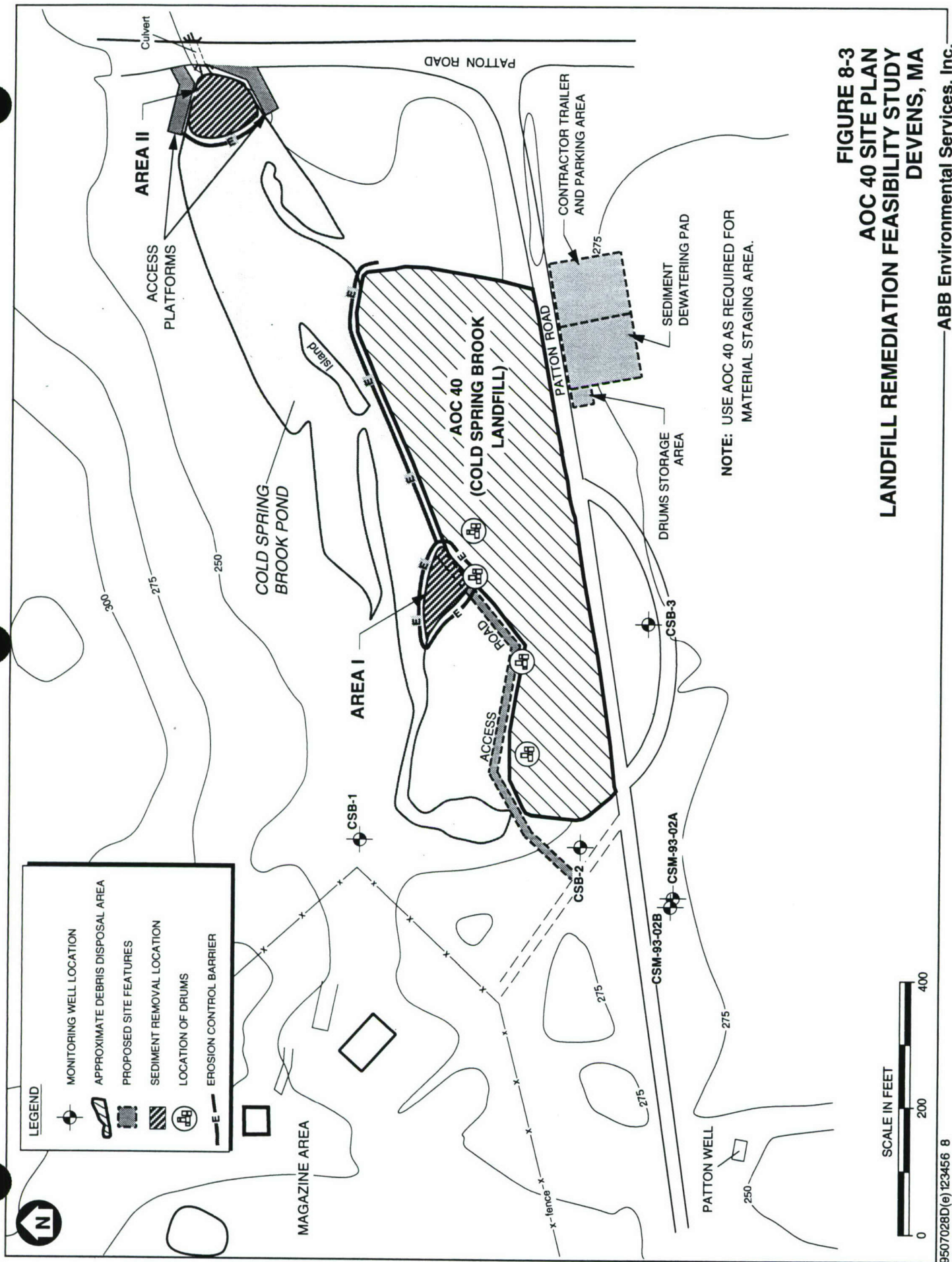
FIGURE 8-1
AOC 9 SITE PLAN
LANDFILL REMEDIATION FEASIBILITY STUDY
DEVENS, MA
ABB Environmental Services, Inc.



Cross Section A-A'

NOTES:

1. SEE FIGURE 8-1 FOR CROSS SECTION ORIENTATION.



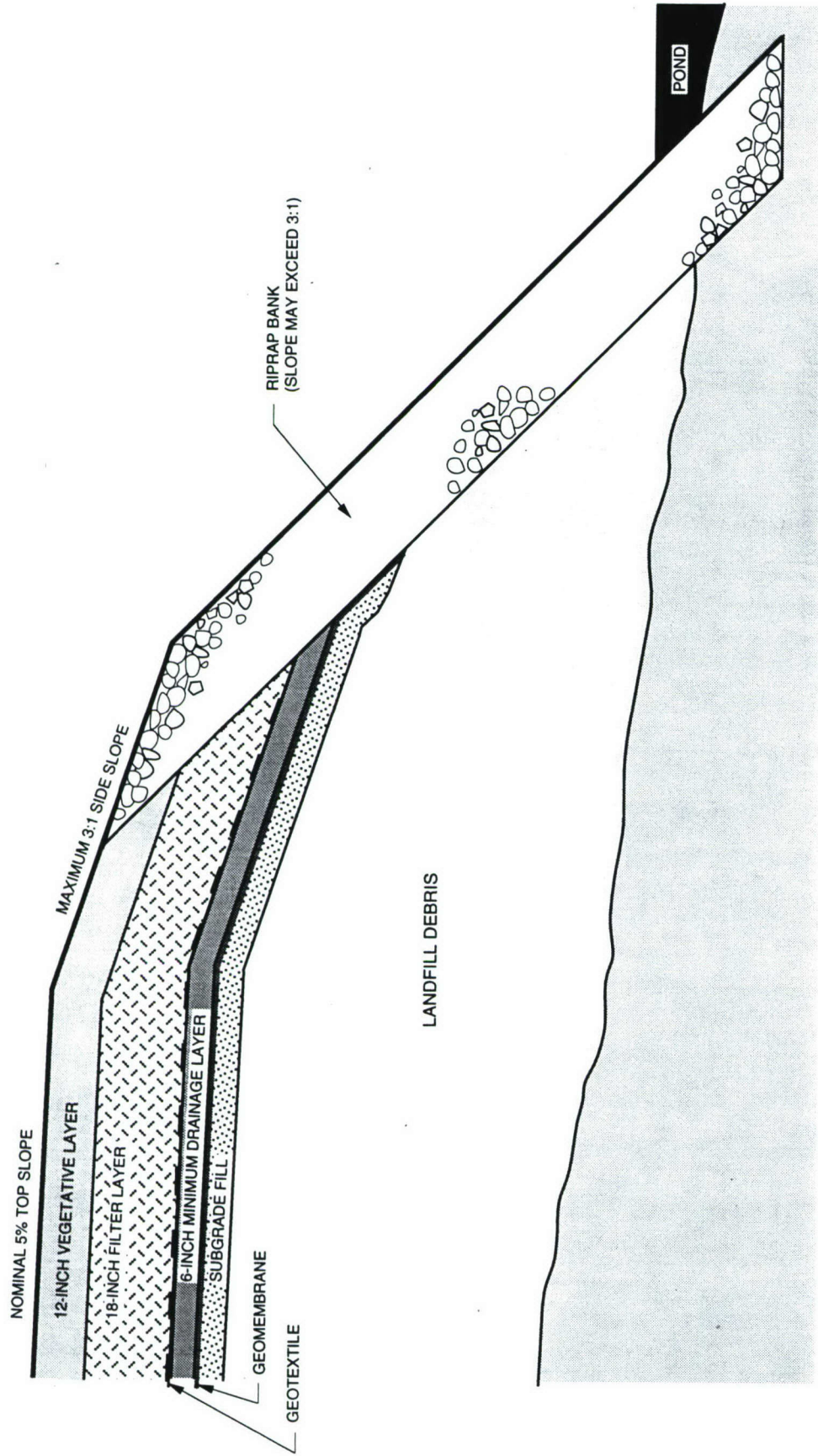
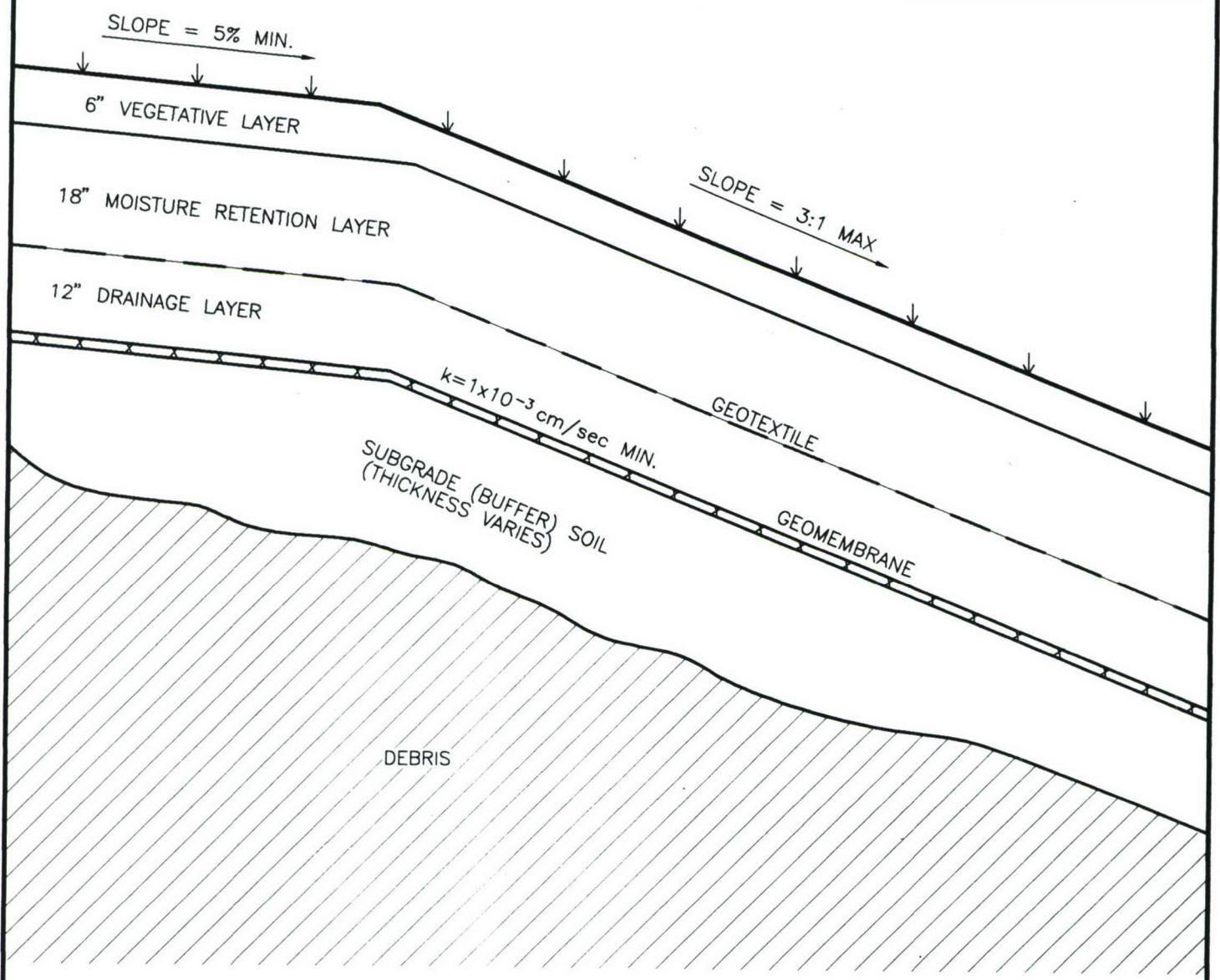
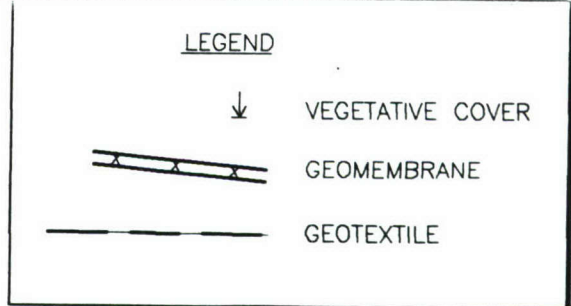


FIGURE 8-4
AOC 40 COVER SYSTEM FOR EXISTING LANDFILL
LANDFILL REMEDIATION FEASIBILITY STUDY
DEVENS, MA

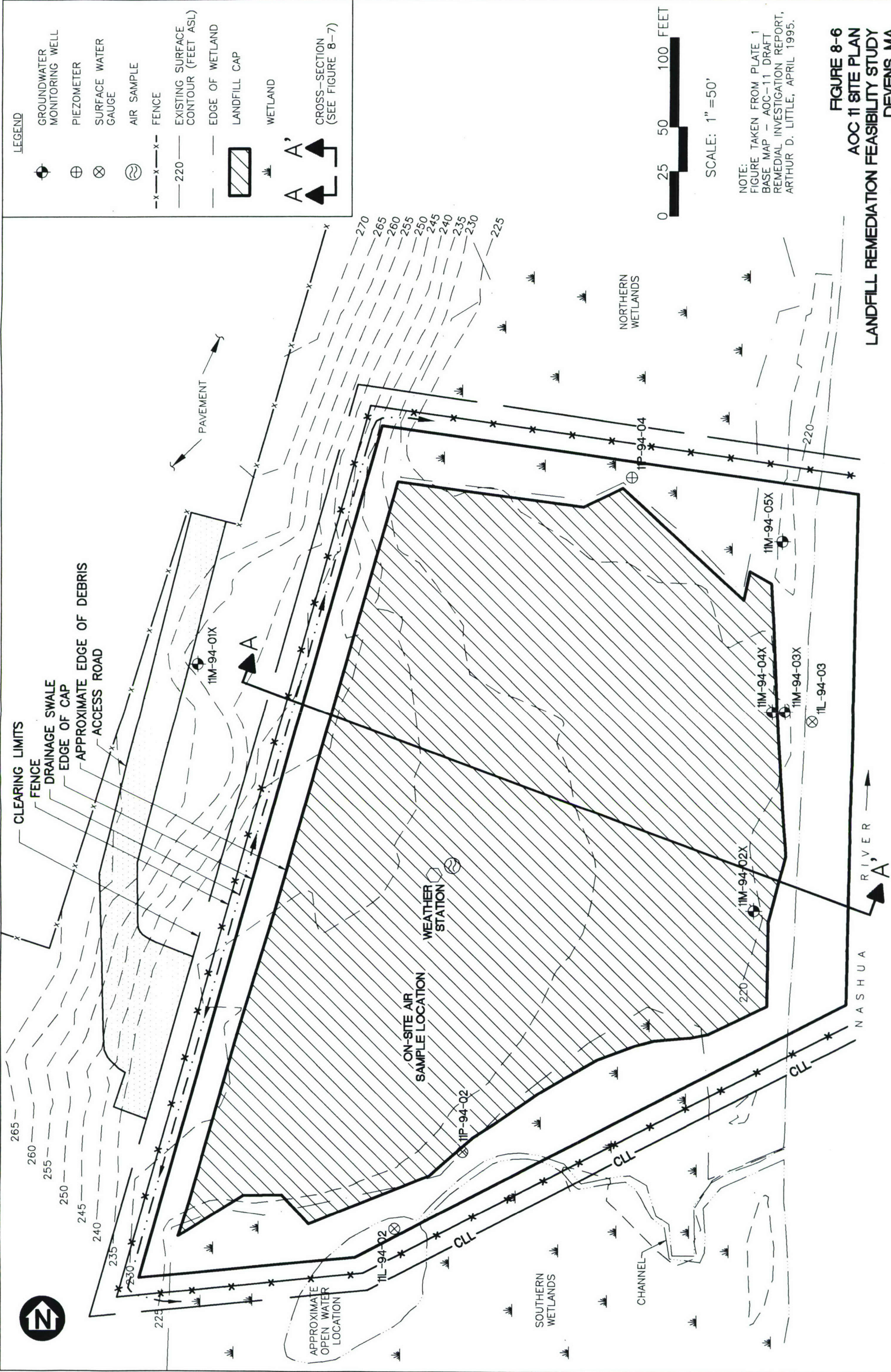
NOT TO SCALE

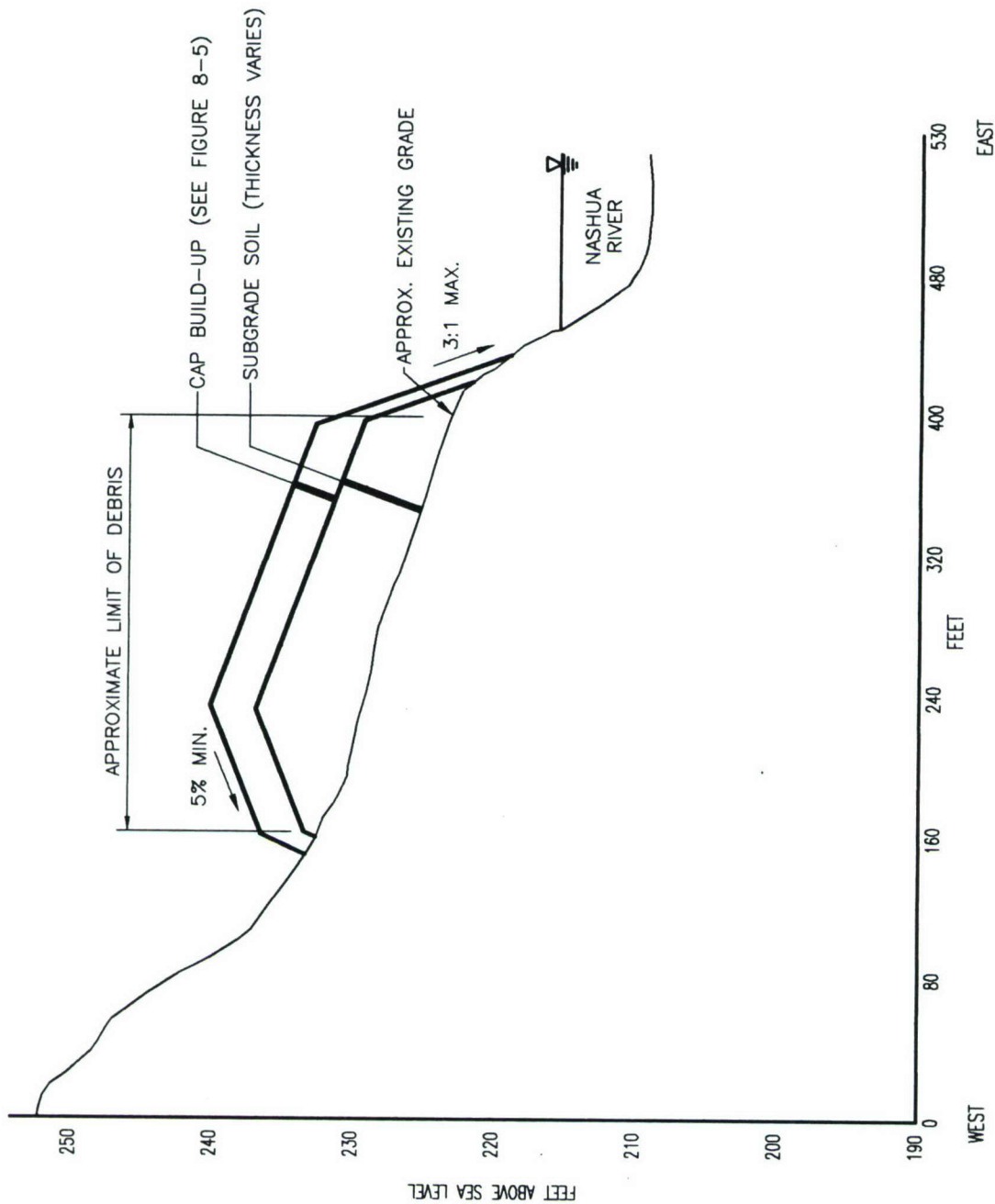


NOT TO SCALE

FIGURE 8-5
CROSS SECTION THROUGH LANDFILL CAP
LANDFILL REMEDIATION FEASIBILITY STUDY
DEVENS, MA

ABB Environmental Services, Inc.

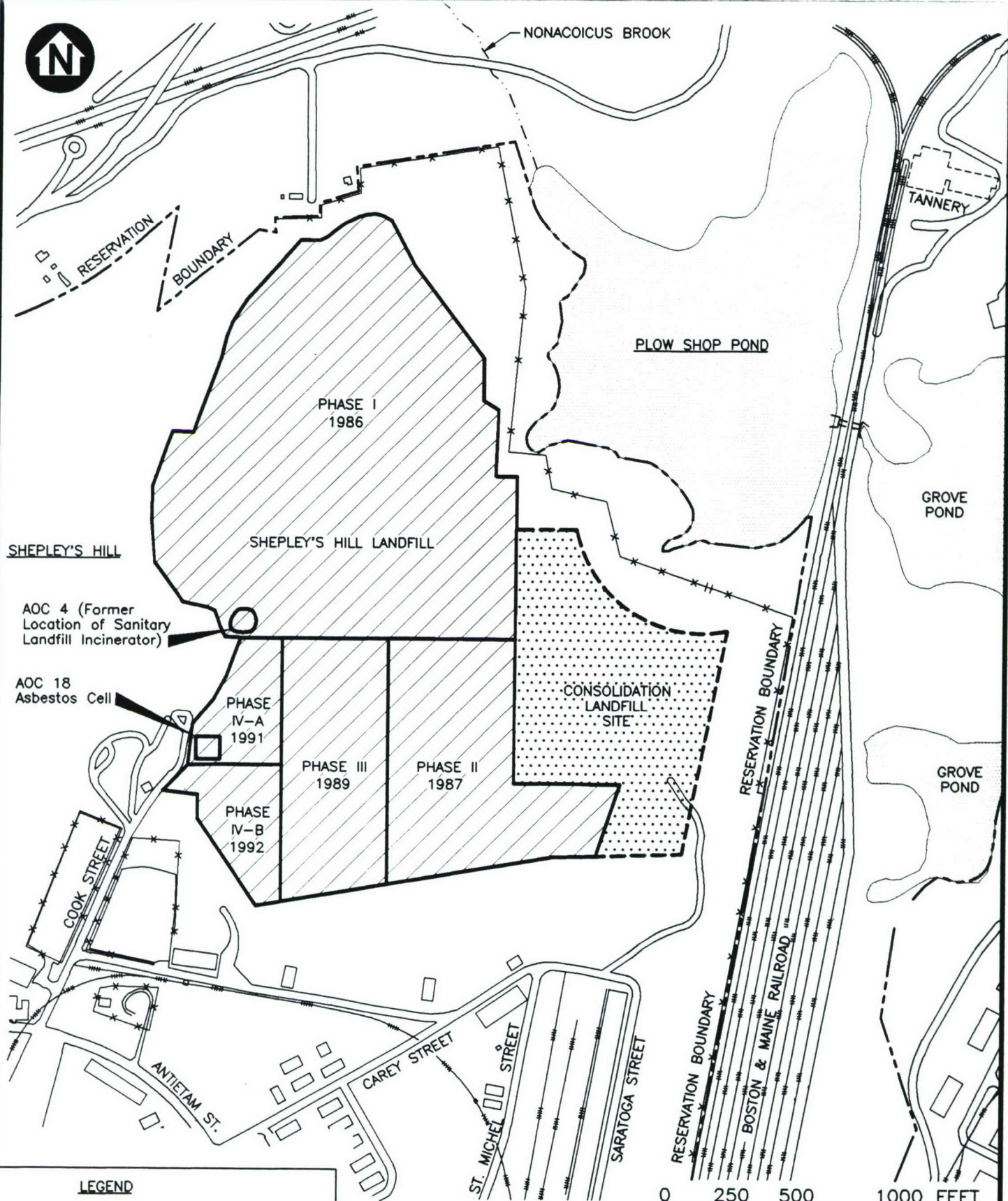




Cross Section A-A'

NOTES:

1. CROSS SECTION TAKEN FROM FIGURE 3-2, DRAFT RI REPORT, ARTHUR D. LITTLE, APRIL 1995.
2. SEE FIGURE 8-6 FOR CROSS SECTION ORIENTATION.



LEGEND

- RESERVATION BOUNDARY
- - - CULVERT
- - - SURFACE DRAINAGE WAY
- RAILROAD TRACKS
- x - x - FENCE
- [Hatched Box] LIMIT OF CLOSED LANDFILL
- [Dotted Box] PROPOSED CONSOLIDATION LANDFILL SITE

SCALE: 1" = 500'

FIGURE 8-8
CONSOLIDATION LANDFILL
SITE LOCATION MAP
LANDFILL REMEDIATION FEASIBILITY STUDY REPORT
DEVENS, MA

ABB Environmental Services, Inc.

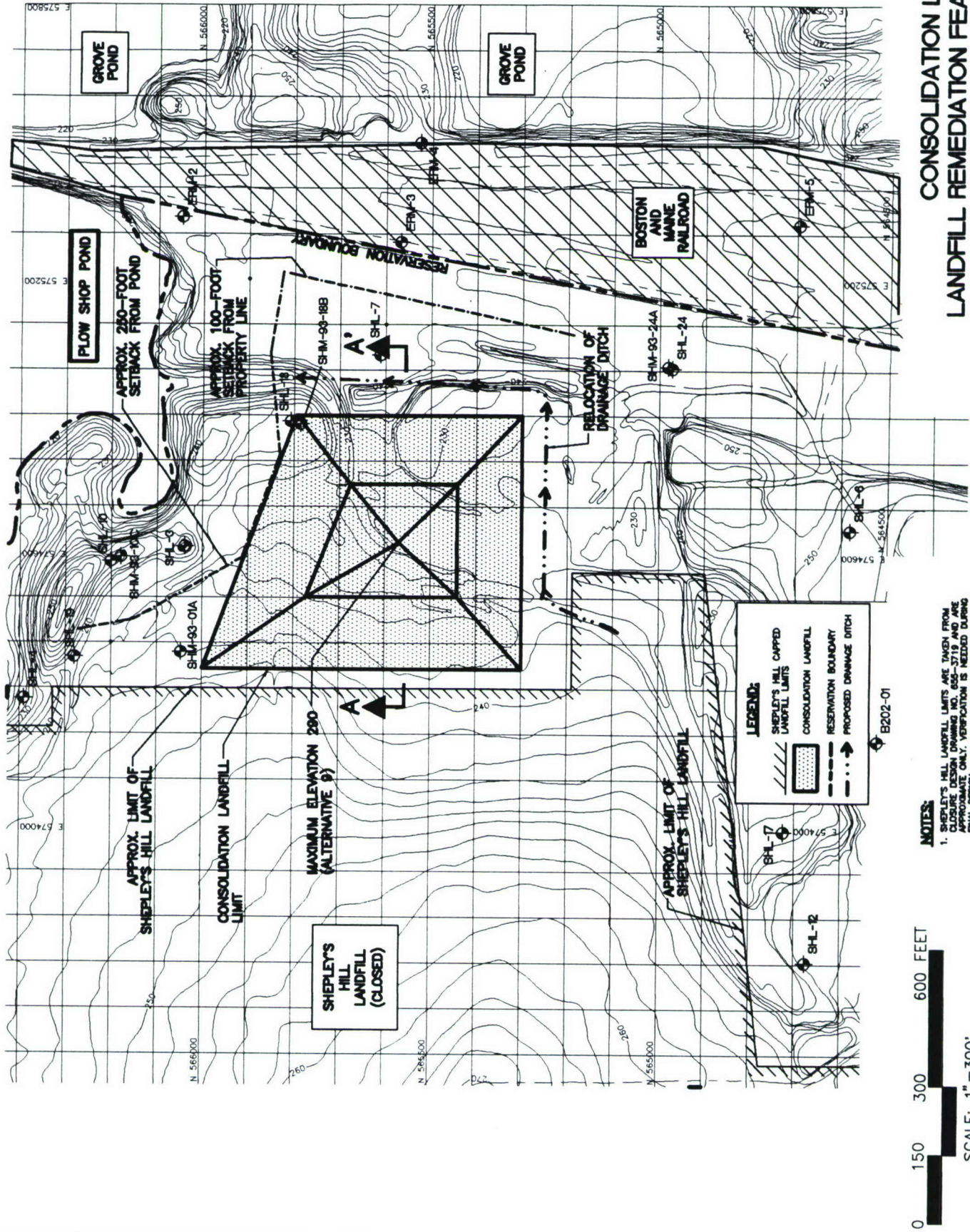


FIGURE 8-9
CONSOLIDATION LANDFILL PLAN
LANDFILL REMEDIATION FEASIBILITY STUDY
DEVENS, MA
ABB Environmental Services, Inc.

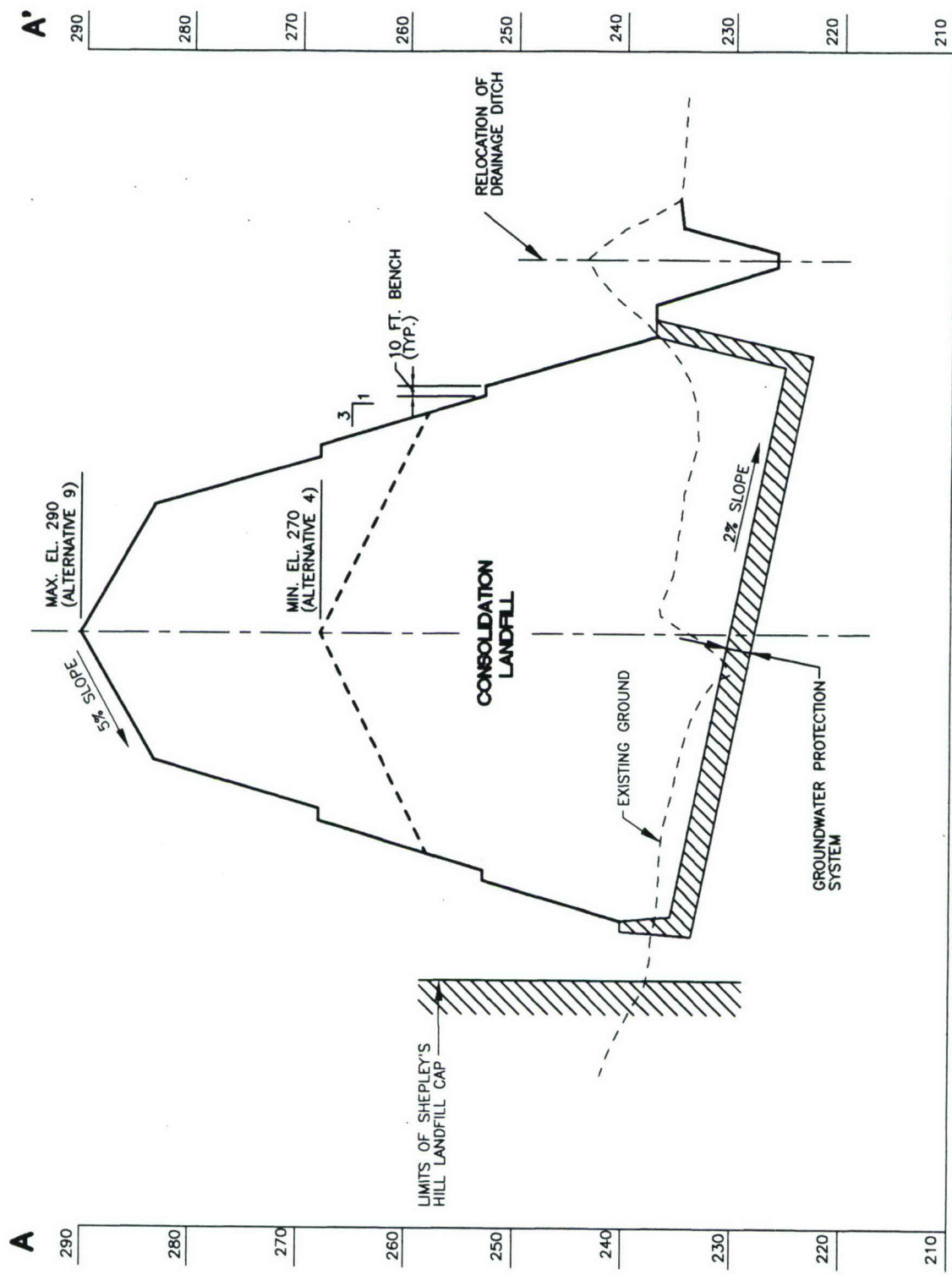
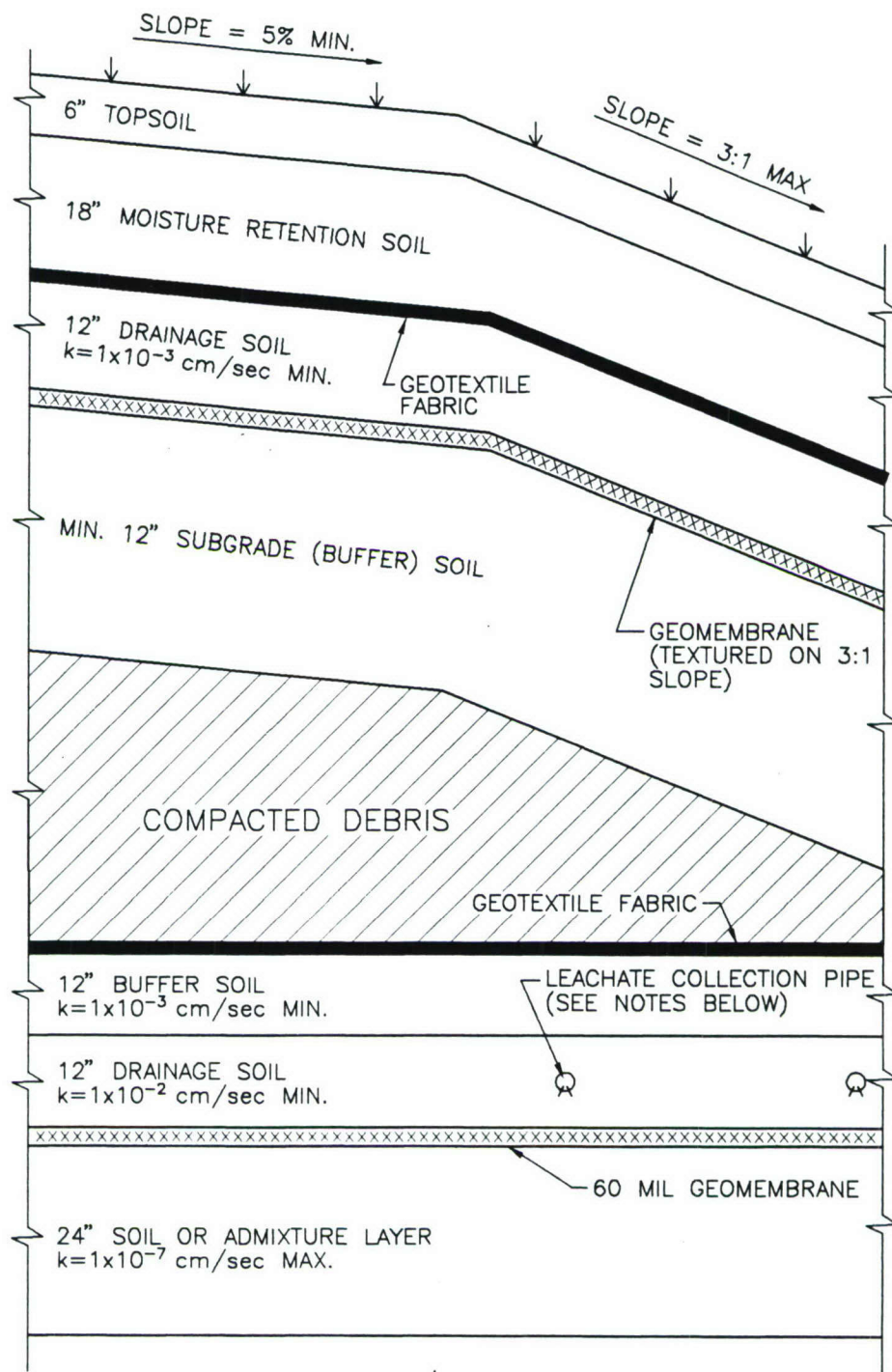


FIGURE 8-10
CONSOLIDATION LANDFILL SECTION
CONSOLIDATION LANDFILL FEASIBILITY STUDY
DEVENS, MA
ABB Environmental Services, Inc.

SECTION A-A'

0 50 100 200 FEET

SCALE: HORIZ. 1"=100'
 VERT. 1"=10'



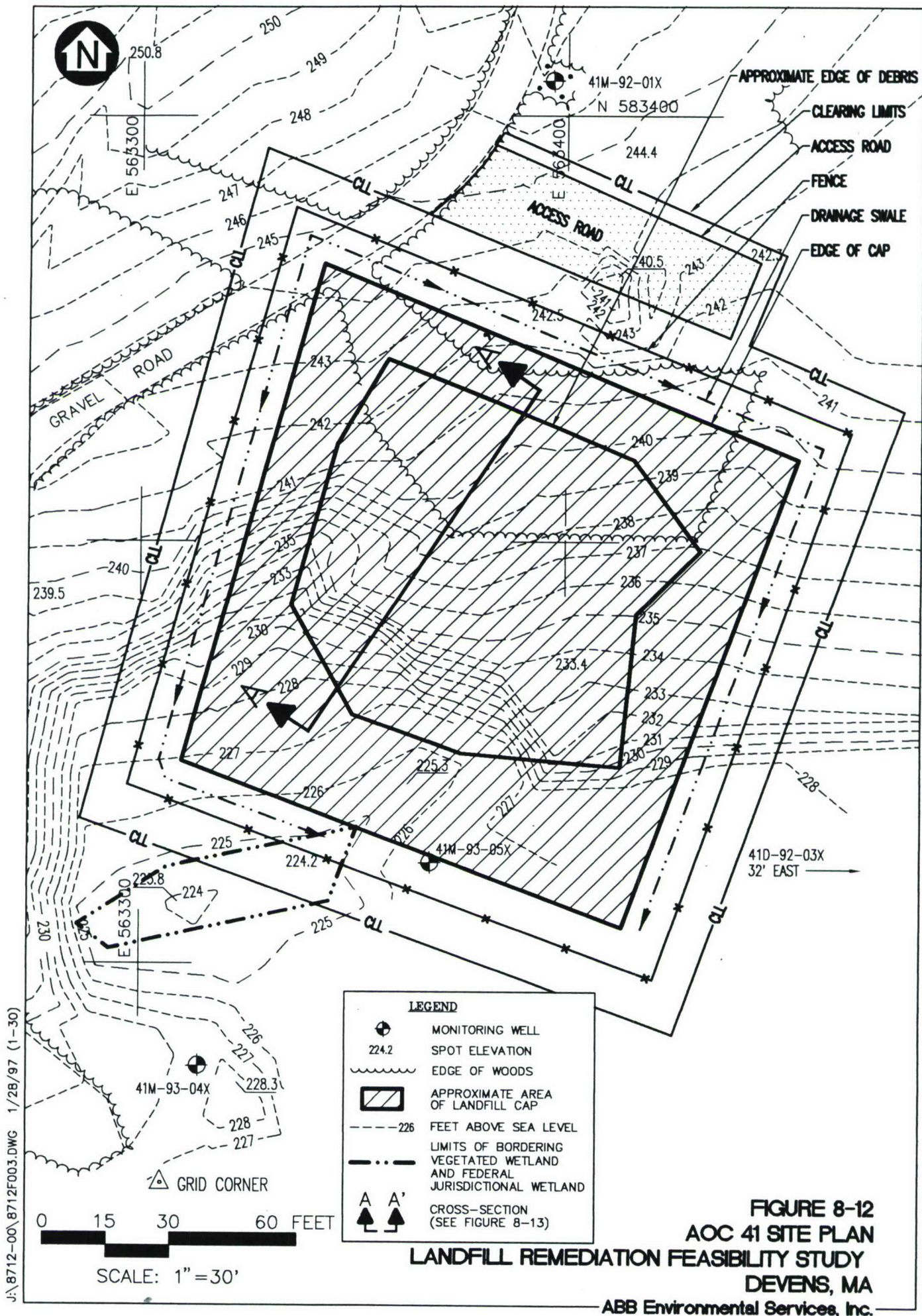
NOTES:

1. LINER TO BE SLOPED @ 2% MIN.
2. LEACHATE COLLECTION PIPES (6-INCH DIA.) TO BE SLOPED @ 1% MIN..
3. ALTERNATELY, A GEOSYNTHETIC CLAY LINER MAY BE CONSIDERED FOR THE SOIL OR ADMIXTURE LAYER.

NOT TO SCALE

FIGURE 8-11
CONSOLIDATION LANDFILL CAP AND LINER SECTIONS
LANDFILL REMEDIATION FEASIBILITY STUDY
DEVENS, MA

ABB Environmental Services, Inc.



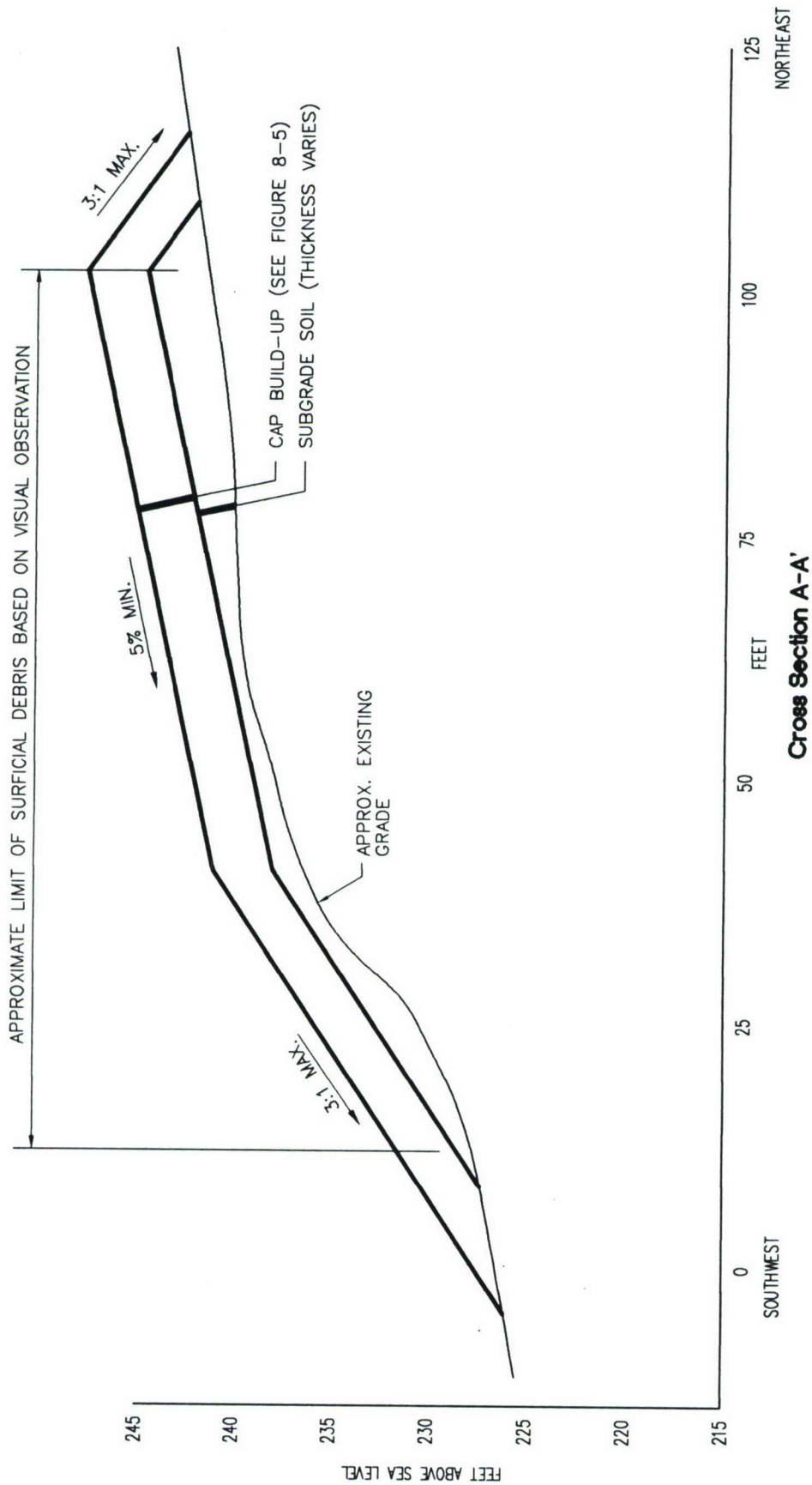


FIGURE 8-13
AOC 41 CROSS SECTION A-A'
LANDFILL REMEDIATION FEASIBILITY STUDY
DEVENS, MA
ABB Environmental Services, Inc.

NOTE:
1. SEE FIGURE 8-12 FOR CROSS SECTION ORIENTATION.

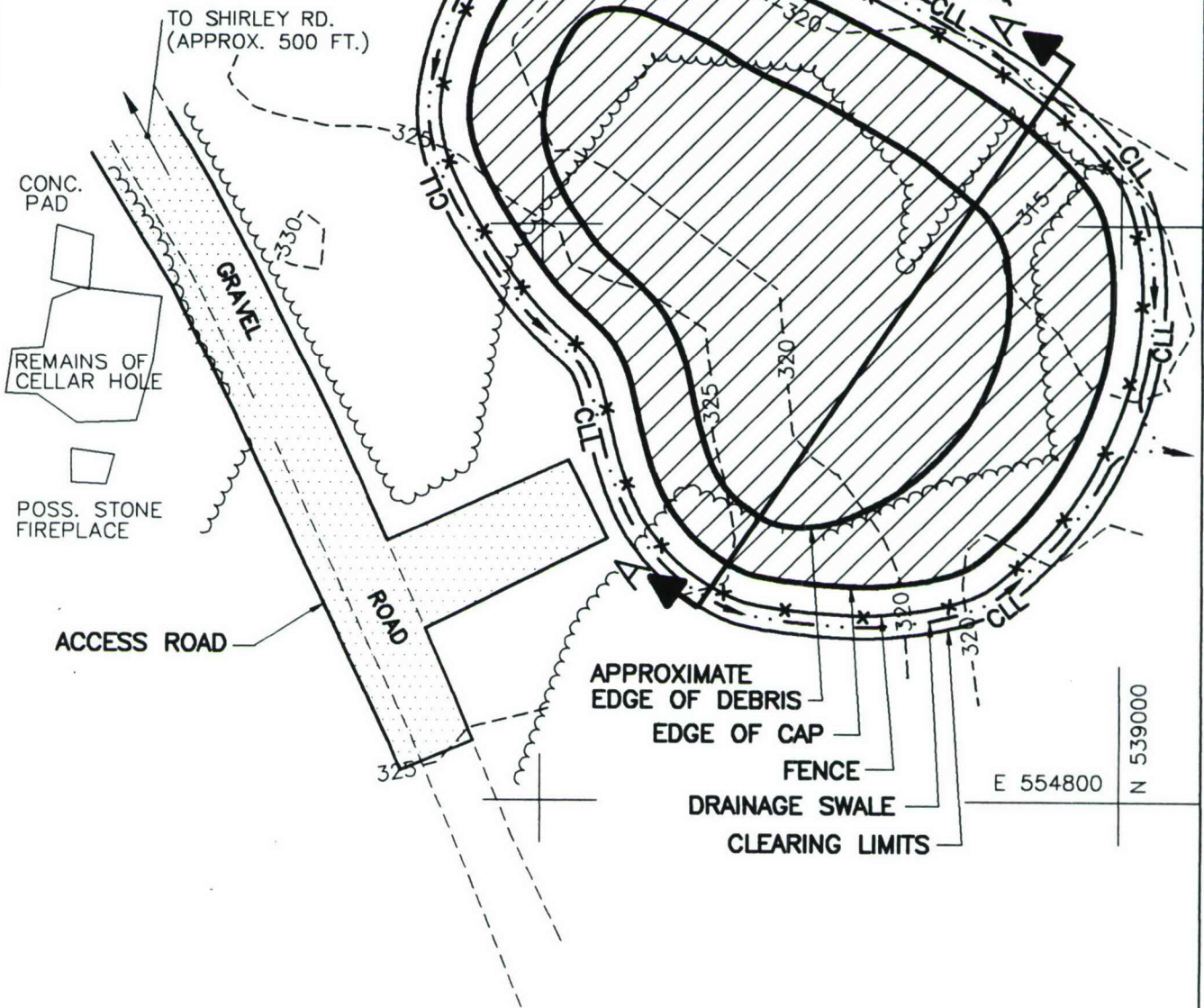
LEGEND

~~~~~ EDGE OF WOODS

 LANDFILL CAP

--- 320 FEET ABOVE SEA LEVEL

  CROSS SECTION (SEE FIGURE 8-15)



**FIGURE 8-14**  
**SA 6 SITE PLAN**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

ABB Environmental Services, Inc.

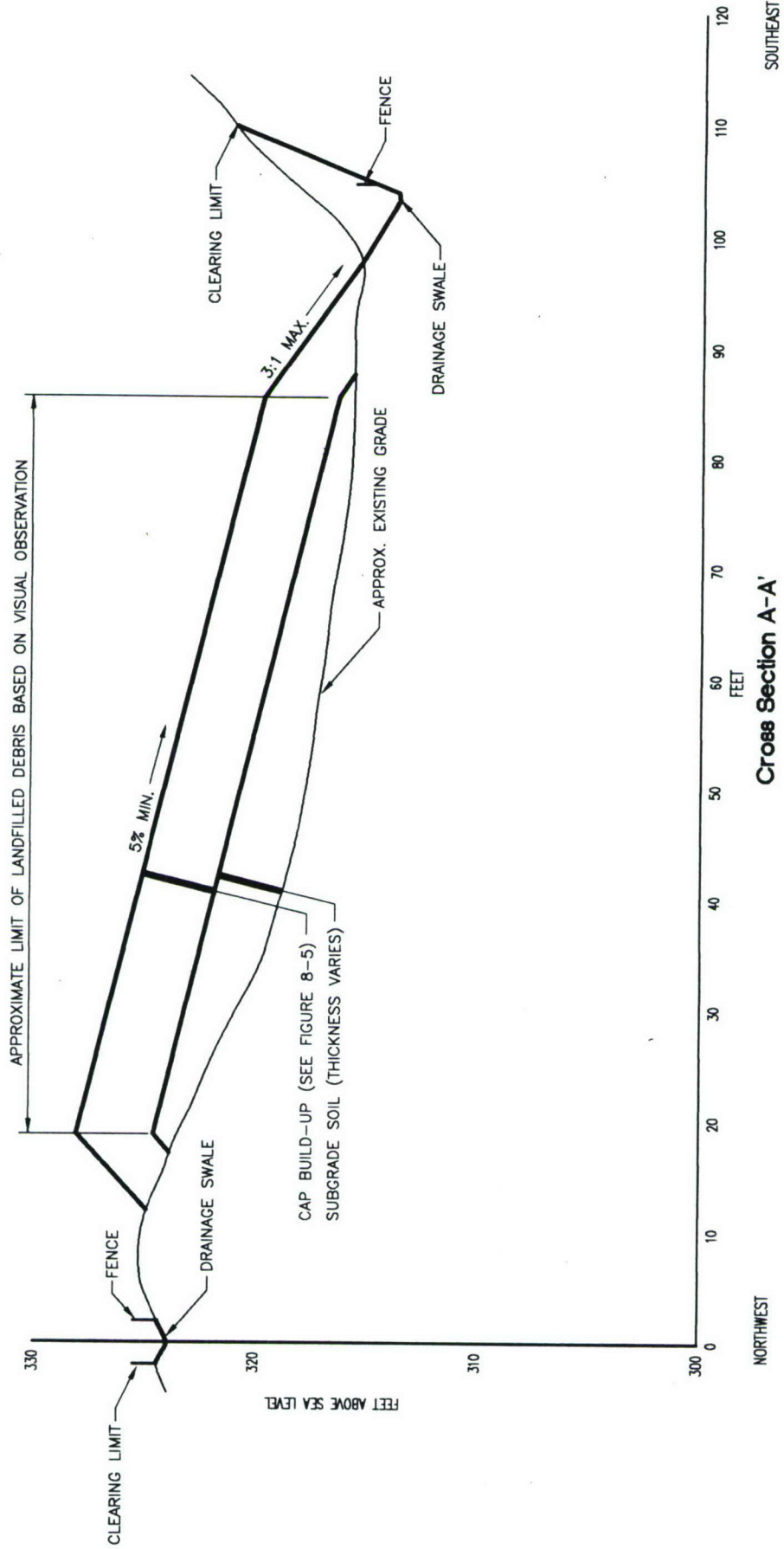


FIGURE 8-15  
SA 6 CROSS SECTION A-A'  
LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA  
ABB Environmental Services, Inc.

NOTE:  
1. SEE FIGURE 8-14 FOR CROSS SECTION ORIENTATION.





E 563300

N 547400

LIMITS OF BORDERING  
VEGETATED WETLAND  
AND FEDERAL  
JURISDICTIONAL WETLAND

100-FOOT  
BUFFER ZONE

CLL

DIXIE

UPOLE  
#3848

CONTRACTOR  
TRAILER AND  
PARKING  
AREA

ACCESS  
ROAD

BITUMINOUS CONCRETE PAVEMENT

MATERIAL  
STAGING  
AREA

12M-92-01X

ACCESS  
ROAD

E 563300

N 547100

UPOLE  
#3846

ROAD

E 563400

#### LEGEND

--- LIMITS OF BORDERING  
VEGETATED WETLAND  
AND FEDERAL  
JURISDICTIONAL WETLAND

~ EDGE OF WOODS

U UTILITY POLE

M MONITORING WELL  
WITH BOLLARDS

LANDFILL CAP

260 -- FEET ABOVE SEA LEVEL



WETLAND

CLL

CLEARING LIMIT  
LINE

--- 100 YEAR

FLOODPLAIN  
BOUNDARY  
(NASHUA RIVER)

A

A'

CROSS SECTION  
(SEE  
FIGURE 8-17)

DRAINAGE SWALE

LIMITS OF BORDERING  
VEGETATED WETLAND  
AND FEDERAL  
JURISDICTIONAL WETLAND

0 25 50 100 FEET

SCALE: 1"=50'

FIGURE 8-16

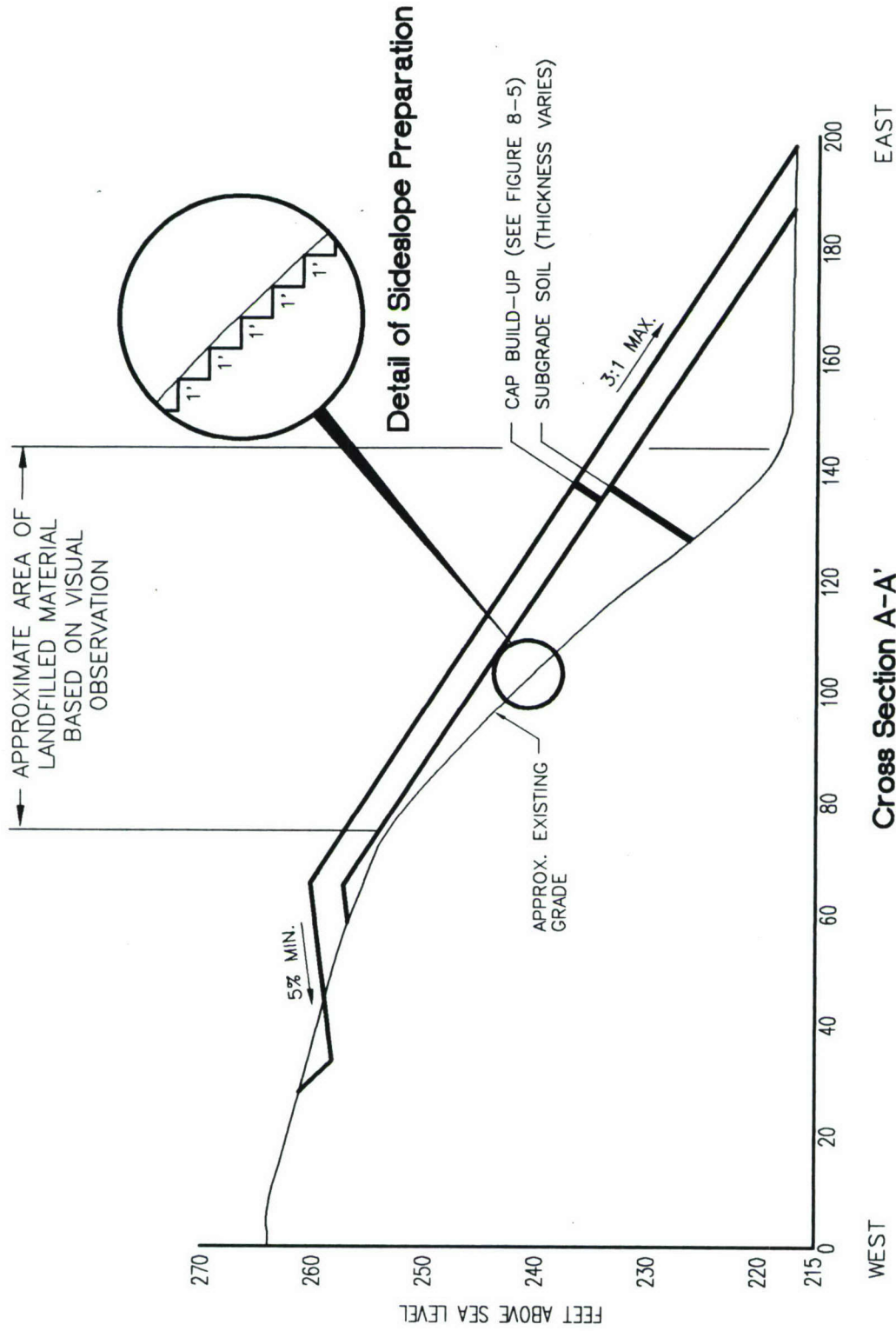
SA 12 SITE PLAN

LANDFILL REMEDIATION FEASIBILITY STUDY

DEVENS, MA

ABB Environmental Services, Inc.

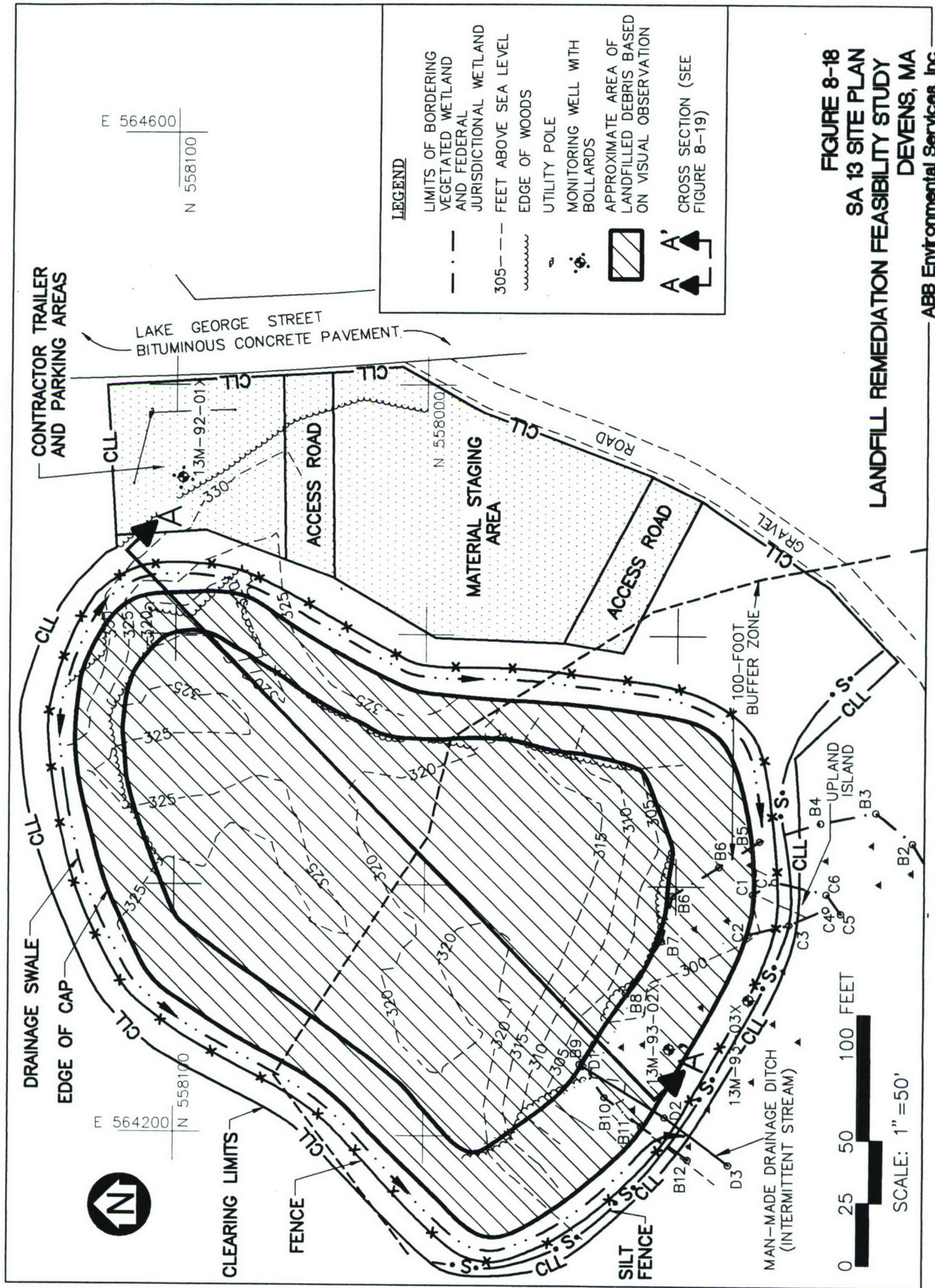
J:\8712-04\8712F032.DWG 1"=50' 1/28/97



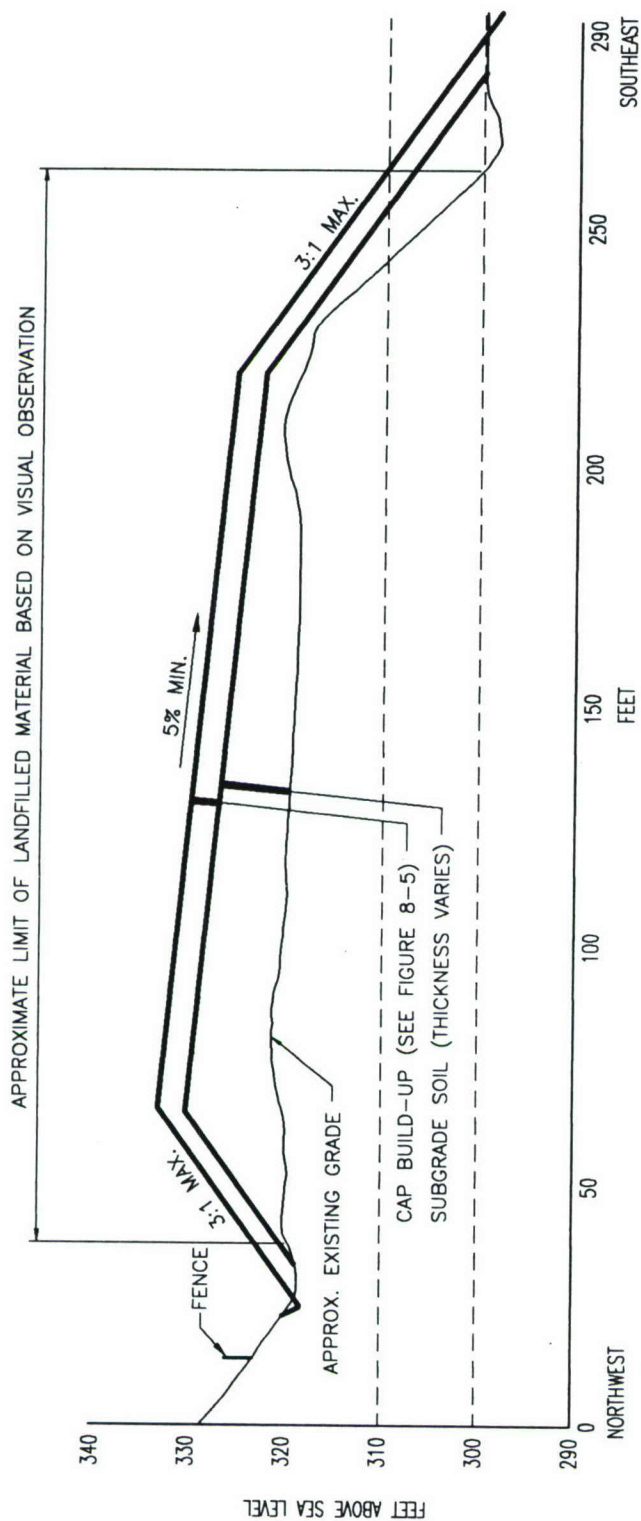
**NOTES:**

1. SEE FIGURE 8-16 FOR CROSS SECTION ORIENTATION.
2. EXCAVATE SIDESLOPES IN 1' STEPS TO AID SLOPE STABILITY.





**FIGURE 8-18**  
**SA 13 SITE PLAN**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**  
**ABB Environmental Services, Inc.**



Cross Section A-A'

NOTE:

1. SEE FIGURE 8-18 FOR CROSS SECTION ORIENTATION.





**TABLE ES-1**  
**SUMMARY OF CONSIDERED LANDFILL REMEDIATION ALTERNATIVES**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| ALTERNATIVE    | ALTERNATIVE COMPONENT                 |                                |                               |                                                  |                         |
|----------------|---------------------------------------|--------------------------------|-------------------------------|--------------------------------------------------|-------------------------|
|                | EXCAVATE/<br>CONSOLIDATE              | CAP-IN-PLACE                   | EXCAVATE/<br>DISPOSE OFF-SITE | LIMITED REMOVAL<br>(SURFACE DEBRIS)              | NO FURTHER ACTION       |
| 1 <sup>3</sup> |                                       |                                |                               |                                                  | All seven landfills     |
| 2              |                                       | AOCs 9, 40                     |                               | AOC 11 - dispose<br>under AOC 9 Cap              | AOC 41<br>SAs 6, 12, 13 |
| 3              |                                       | AOCs 9, 11,<br>40              |                               |                                                  | AOC 41<br>SAs 6, 12, 13 |
| 4              | AOCs 9, 40                            |                                |                               | AOC 11 - dispose<br>in consolidation<br>landfill | AOC 41<br>SAs 6, 12, 13 |
| 5              | AOCs 9, 40                            | AOC 41<br>SAs 6, 12, 13        |                               | AOC 11 - dispose<br>in consolidation<br>landfill |                         |
| 6              | AOCs, 9, 11,<br>40                    | AOC 41<br>SAs 6, 12, 13        |                               |                                                  |                         |
| 7              |                                       | All seven<br>disposed<br>areas |                               |                                                  |                         |
| 8              | AOCs 9, 40,<br>41<br>SAs 6, 12,<br>13 |                                |                               | AOC 11 - dispose<br>in consolidation<br>landfill |                         |
| 9              | All seven<br>landfills                |                                |                               |                                                  |                         |

**Notes:**

- <sup>1</sup> PA-1 = BCT Plan of Action (3/31/95), Option 1.
- <sup>2</sup> Alternative PA-2 is identical to Alternative 9.
- <sup>3</sup> Alternatives 1 through 9 were developed by the BCT on December 9, 1996.



**TABLE ES-1**  
**SUMMARY OF CONSIDERED LANDFILL REMEDIATION ALTERNATIVES**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| ALTERNATIVE       | ALTERNATIVE COMPONENT                                                |                       |                               |                                     |                   |
|-------------------|----------------------------------------------------------------------|-----------------------|-------------------------------|-------------------------------------|-------------------|
|                   | EXCAVATE/<br>CONSOLIDATE                                             | CAP-IN-PLACE          | EXCAVATE/<br>DISPOSE OFF-SITE | LIMITED REMOVAL<br>(SURFACE DEBRIS) | NO FURTHER ACTION |
| PA-1 <sup>1</sup> |                                                                      | AOCs 9, 11,<br>40, 41 | SAs 6, 12, 13                 |                                     |                   |
| PA-2 <sup>2</sup> | All seven<br>landfills<br>(near<br>Shepley's<br>Hill)                |                       |                               |                                     |                   |
| PA-3              | AOCs 9, 40,<br>41<br>SAs 6, 12,<br>13<br>(at North<br>Post Landfill) | AOC 11                |                               |                                     |                   |
| PA-4              | All seven<br>landfills (at<br>North Post<br>Landfill)                |                       |                               |                                     |                   |
| PA-5              | AOCs 40, 41<br>SAs 6, 12,<br>13<br>(near<br>Shepley's<br>Hill)       | AOCs 9, 11            |                               |                                     |                   |
| PA-6              | AOCs 9, 11,<br>41<br>SAs 6, 12,<br>13<br>(near<br>Shepley's<br>Hill) | AOC 40                |                               |                                     |                   |

**TABLE ES-2**  
**COMPARATIVE ANALYSIS OF ALTERNATIVES**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| EVALUATION CRITERIA                                           | DEGREE OF ADHERENCE TO EVALUATION CRITERIA |        |        |         |         |         |         |         |         |
|---------------------------------------------------------------|--------------------------------------------|--------|--------|---------|---------|---------|---------|---------|---------|
|                                                               | ALTERNATIVE NO.                            |        |        |         |         |         |         |         |         |
|                                                               | 1                                          | 2      | 3      | 4       | 5       | 6       | 7       | 8       | 9       |
| Overall protection of human health and the environment        | Low                                        | Medium | Medium | Medium  | High    | High    | High    | Medium  | High    |
| Compliance with ARARs                                         | Low                                        | Medium | Medium | Medium  | Medium  | High    | High    | Medium  | High    |
| Long-term effectiveness and permanence                        | Low                                        | Medium | Medium | Medium  | High    | High    | High    | Medium  | High    |
| Reduction of toxicity, mobility, and volume through treatment | None                                       | Low    | Low    | Low     | Low     | Low     | Low     | Low     | Low     |
| Effectiveness: Short-term                                     | None                                       | Medium | Medium | Medium  | Medium  | Medium  | Medium  | Medium  | Medium  |
| Implementability                                              | Low                                        | Medium | Medium | Medium  | Medium  | Medium  | Medium  | Medium  | Medium  |
| Cost                                                          | None                                       | \$7.6M | \$9.5M | \$16.6M | \$19.6M | \$21.6M | \$12.5M | \$18.1M | \$20.2M |



**TABLE 3-1**  
**INTERPRETED RISK ASSESSMENT SUMMARY**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| AREA OF CONTAMINATION<br>AND MEDIUM | RISK EVALUATION<br>APPROACH | INTERPRETED<br>HUMAN HEALTH RISK | INTERPRETED<br>ECOLOGICAL RISK |
|-------------------------------------|-----------------------------|----------------------------------|--------------------------------|
| <b>SA 6</b>                         | Not applicable              | None anticipated                 | None anticipated               |
| <b>AOC 9</b>                        |                             |                                  |                                |
| Surface Soil                        | PRE                         | No                               | No                             |
| Subsurface Soil                     | PRE                         | No                               | Not evaluated                  |
| Groundwater                         | PRE                         | No <sup>1, 2</sup>               | Not evaluated                  |
| Surface Water                       | PRE                         | No <sup>3</sup>                  | No <sup>6</sup>                |
| Sediment                            | PRE                         | No <sup>4</sup>                  | No                             |
| <b>AOC 11</b>                       |                             |                                  |                                |
| Surface Soil                        | Baseline RA                 | No                               | No                             |
| Surface Water                       | Baseline RA                 | No                               | No <sup>7</sup>                |
| Sediment                            | Baseline RA                 | No                               | No <sup>7</sup>                |
| <b>SA 12</b>                        |                             |                                  |                                |
| Surface Soil                        | PRE                         | Yes (Landfill area)              | Yes (Landfill area)            |
| Groundwater                         | PRE                         | Yes                              | Not evaluated                  |
| Surface Water                       | PRE                         | No <sup>3</sup>                  | No <sup>7</sup>                |
| Sediment                            | PRE                         | No <sup>4</sup>                  | No <sup>7</sup>                |
| <b>SA 13</b>                        |                             |                                  |                                |
| Surface Soil                        | PRE                         | Yes                              | Yes                            |
| Groundwater                         | PRE                         | No <sup>2</sup>                  | Not evaluated                  |
| Surface Water                       | PRE                         | No <sup>3</sup>                  | Yes                            |
| Sediment                            | PRE                         | No <sup>4</sup>                  | Yes                            |
| <b>AOC 40</b>                       |                             |                                  |                                |
| Surface Soil                        | Baseline RA                 | No                               | No                             |
| Groundwater                         | Baseline RA                 | No <sup>5</sup>                  | Not Evaluated                  |
| Surface Water                       | Baseline RA                 | No                               | No                             |
| Sediment                            | Baseline RA                 | No                               | Yes                            |
| <b>AOC 41</b>                       |                             |                                  |                                |
| Surface Soil                        | PRE                         | Yes                              | No                             |
| Surface Water                       | PRE                         | No <sup>3</sup>                  | No <sup>6</sup>                |
| Sediment                            | PRE                         | No <sup>4</sup>                  | No <sup>8</sup>                |

**Notes:**

- <sup>1</sup> Data review shows groundwater contamination at upgradient and crossgradient wells, therefore potential risk is interpreted as non site related.
- <sup>2</sup> Comparison of unfiltered groundwater-sample data for inorganics to drinking water screening values suggests risk; however, based on filtered-sample data, high inorganic concentrations appear associated with entrained suspended solids.
- <sup>3</sup> Comparison of surface water data to drinking water screening values suggests potential risk; however, probability of significant overstatement exists because exposure to surface water is expected to be less than for drinking water scenario.
- <sup>4</sup> Comparison of sediment data to residential soil screening values suggests potential risk; however, probability of significant overstatement exists because exposure to sediment is expected to be less than for residential scenario.
- <sup>5</sup> Comparison of groundwater data to a future residential use scenario suggests potential risk; however, probability of significant overstatement exists because there is no residential groundwater exposure under current land use conditions.
- <sup>6</sup> Comparison of unfiltered surface water sample data to AWQC suggests potential risks; however, suspended contaminants may not be bioavailable. Further, regulatory test species are considered not representative of AOC species.
- <sup>7</sup> Complete data review shows contamination in surface water and sediments is most likely attributed to Nashua River contamination and is not site related.
- <sup>8</sup> Interim Sediment Quality Criteria used for screening of DDT are overly conservative for Devens.

**TABLE 4-1**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| AUTHORITY                    | LOCATION CHARACTERISTIC    | REQUIREMENT                                                                     | STATUS                   | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------|----------------------------|---------------------------------------------------------------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal Regulatory Authority | Floodplains                | Floodplain Management Executive Order No. 11988 [40 CFR Part 6, App. A]         | Applicable               | Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.                                                                                                                                                                                                               |
|                              | Wetlands                   | Protection of Wetlands Executive Order No. 11990 [40 CFR Part 6, App. A]        | Applicable               | Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.                                                                                                                                                                                                                                                                                                                       |
|                              | Wetlands Aquatic Ecosystem | CWA, Dredge or Fill Requirements Section 404 [33 CFR Part 230; 40 CFR Part 230] | Applicable               | Section 404 of the CWA regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a discharge of fill materials. Procedures for complying with regulatory conditions are contained in 33 CFR Part 323. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under CWA Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands. |
|                              | Archeological Sites        | Archeological Resources Protection Act of 1979 [16 USC 47099-11]                | Relevant and Appropriate | This law prohibits the excavation, damage, alteration, and trade of archeological resources obtained illegally from public or Native American.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |



**TABLE 4-1**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| <b>AUTHORITY</b>                                  | <b>LOCATION CHARACTERISTIC</b>                            | <b>REQUIREMENT</b>                                                                                                                                                             | <b>STATUS</b>                  | <b>REQUIREMENT SYNOPSIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal<br>Regulatory<br>Authority<br>(continued) | Archeological and<br>Historic Sites                       | Archeological and<br>Historic Data<br>Preservation Act [16<br>USC 469-469c; 40 CFR<br>469; 40 CFR 6.301(c)]<br>and National Historic<br>Preservation Act [16<br>USC 470-470w6] | Applicable                     | These laws establish the procedures for the inventory, registration, and preservation of historical and archeological resources. Such resources must be retrieved, preserved, and properly managed when terrain is altered as a result of a federal or federally licensed construction activity.                                                                                                                                                                                       |
|                                                   | Surface Waters<br>Endangered Species<br>Migratory Species | Fish and Wildlife<br>Coordination Act [16<br>USC 661 et seq.; 40<br>CFR Part 302]                                                                                              | Applicable                     | Actions that affect species/habitat require consultation with DOI, FWS, NMFS, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. |
|                                                   | Endangered Species                                        | Endangered Species<br>Act [16 USC 1531 et<br>seq.; 50 CFR Part 402]                                                                                                            | Relevant<br>and<br>Appropriate | This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.                                                                                                                                                                                                                                                                                                                                    |
|                                                   | Atlantic Flyway Wetlands<br>Surface Waters                | Migratory Bird Treaty<br>Act (16 USC 703-711)                                                                                                                                  | Relevant<br>and<br>Appropriate | The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.                                                                                                                                                                                                                                                                                 |
| State<br>Regulatory<br>Authority                  | Floodplains<br>Wetlands<br>Surface Waters                 | Massachusetts Wetland<br>Protection Act and<br>regulations [MGL c. 131<br>s. 40; 310 CMR 10.00]                                                                                | Applicable                     | These regulations include permitting requirements and performance standards on dredging, filling, altering, or polluting surface waters, floodplains, and wetlands. Work within 100 feet of a bank of a surface water or of a vegetated wetland is also regulated under these requirements. This state law is locally administered, often in conjunction with local wetland laws, by the Conservation Commission.                                                                      |

TABLE 4-1  
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| AUTHORITY                              | LOCATION CHARACTERISTIC | REQUIREMENT                                                                                                 | STATUS     | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                |
|----------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State Regulatory Authority (continued) | Endangered Species      | Massachusetts Endangered Species Act and implementing regulations [MGL c. 131A, s. 1 et seq.; 321 CMR 8.00] | Applicable | Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.                                  |
|                                        | Nashua River            | Scenic Rivers Act [MGL c. 21 s. 27B]                                                                        | Applicable | As part of the Massachusetts Department of Environmental Management's Scenic Rivers Program, the Nashua River and contiguous land up to 100 yards on each side of its natural banks are afforded special protection under this law. |

Notes:

CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Regulations  
 CWA = Clean Water Act  
 DOI = Department of the Interior  
 FWS = Fish and Wildlife Service  
 MEPA = Massachusetts Environmental Policy Act  
 MGL = Massachusetts General Laws  
 NMFS = National Marine Fisheries Service  
 USC = United States Code



TABLE 4-2  
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| AUTHORITY                    | CHEMICAL MEDIUM | REQUIREMENT                                                                                                                                  | STATUS     | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal Regulatory Authority | Surface water   | CWA, Ambient Water Quality Criteria [40 CFR 131; Quality Criteria for Water 1986]                                                            | Applicable | Federal AWQC include (1) health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and (2) acute and chronic toxicity values for the protection of aquatic life. AWQC for the protection of human health provide protective concentrations for exposure from ingesting contaminated water and contaminated aquatic organisms, and from ingesting contaminated aquatic organisms alone. Remedial actions involving contaminated surface water or discharge of contaminants to surface water must consider the uses of the water and the circumstances of the release or threatened release. |
|                              | Groundwater     | Safe Drinking Water Act (SDWA), National Primary Drinking Water Regulations (NPDWR), MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.53] | Applicable | The NPDWR establishes MCLs and MCLGs for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health goals.                                                                                                                                              |

continued

TABLE 4-2  
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS  
LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| AUTHORITY                  | CHEMICAL MEDIUM | REQUIREMENT                                                  | STATUS     | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------|-----------------|--------------------------------------------------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State Regulatory Authority | Surface water   | Massachusetts Surface Water Quality Standards [314 CMR 4.00] | Applicable | Massachusetts Surface Water Quality Standards designate the most sensitive uses for which surface waters of the Commonwealth are to be enhanced, maintained, and protected, and designate minimum water quality criteria for sustaining the designated uses. Surface waters at Fort Devens are classified as Class B. Surface waters assigned to this class are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. These criteria supersede federal AWQC only when they are more stringent (more protective) than the AWQC. |

Notes:

AWQC = Ambient Water Quality Criteria  
 CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act  
 CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Rules  
 CWA = Clean Water Act  
 MCL = Maximum Contaminant Level  
 MCLG = Maximum Contaminant Level Goal  
 MMCL = Massachusetts Maximum Contaminant Level  
 NPDWR = National Primary Drinking Water Regulations  
 SDWA = Safe Drinking Water Act  
 SMCL = Secondary Maximum Contaminant Level



**TABLE 4-3**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| AUTHORITY                          | ACTION                                                                                    | REQUIREMENTS                                                                                                 | STATUS     | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal<br>Regulatory<br>Authority | Construction over/in<br>navigable waters.                                                 | Rivers and Harbors Act of<br>1899<br>[33 USC 401 et seq.]                                                    | Applicable | Section 10 of the Rivers and Harbors Act of 1899 requires an authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers (USACE), for the construction of any structure in or over any "navigable water of the U.S."; the excavation from or deposition of material in such waters, or any obstruction of alteration in such waters. |
|                                    | Control of surface<br>water runoff.<br>Direct discharge to<br>surface water.              | CWA, NPDES Permit<br>Program [40 CFR 122,125]                                                                | Applicable | The NPDES permit program specifies the permissible concentration or level of contaminants in the discharge from any point source to waters of the United States.                                                                                                                                                                                                       |
|                                    | Land Disposal of<br>Hazardous Wastes.                                                     | Resource Conservation and<br>Recovery Act (RCRA), Land<br>Disposal Restrictions (LDRs);<br>(40 CFR Part 268) | Applicable | Testing may determine that a small portion of wastes at the Devens RFTA landfills meets the RCRA definition of restricted wastes. LDRs specify that such hazardous waste be disposed in a RCRA Subtitle C permitted facility.                                                                                                                                          |
| State<br>Regulatory<br>Authority   | Solid Waste Landfill<br>Siting.                                                           | Massachusetts Solid Waste<br>Facilities Site Regulations<br>[310 CMR 16.00]                                  | Applicable | These regulations list the criteria used to approve or reject a site from a solid waste landfill.                                                                                                                                                                                                                                                                      |
|                                    | Solid Waste Landfill<br>Construction,<br>Operation, Closure,<br>and Post-Closure<br>Care. | Massachusetts Solid Waste<br>Management Regulations<br>[310 CMR 19.100]                                      | Applicable | These regulations outline the requirements for construction, operation, closure, and post closure at solid waste management facilities in the Commonwealth of Massachusetts.                                                                                                                                                                                           |

**TABLE 4-3**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| <b>AUTHORITY</b>                                | <b>ACTION</b>                                                   | <b>REQUIREMENTS</b>                                                                           | <b>STATUS</b>               | <b>REQUIREMENT SYNOPSIS</b>                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State<br>Regulatory<br>Authority<br>(continued) | Construction over/in<br>a waterway.                             | Massachusetts Waterways<br>Act [MGL c. 91; 310 CMR<br>9.00]                                   | Relevant and<br>Appropriate | The Massachusetts Waterways Act and<br>regulations require that a license from<br>MADEP be obtained for any work in or over<br>any tidelands, river or stream (with respect<br>to which public funds have been expended),<br>or great pond, or outlet thereof.                                                                                                              |
|                                                 | Activities that<br>potentially affect<br>surface water quality. | Massachusetts Water Quality<br>Certification and Certification<br>for Dredging [314 CMR 9.00] | Relevant and<br>Appropriate | For activities that require a MADEP Wetlands<br>Order of Conditions to dredge or fill<br>navigable waters or wetlands, a Chapter 91<br>Waterways License, a USACE permit or any<br>major permit issued by USEPA (e.g., CWA<br>NPDES permit), a Massachusetts Division of<br>Water Pollution Control Water Quality<br>Certification is required pursuant to 314 CMR<br>9.00. |
|                                                 | Actions that affect<br>ambient air quality.                     | Massachusetts Air Pollution<br>Control Regulations<br>[310CMR 7.00]                           | Applicable                  | A permit and appropriate treatment are<br>required for actions that may result in<br>emissions in excess of Massachusetts or<br>national air quality standards.                                                                                                                                                                                                             |

**Notes:**

CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Rules  
 CWA = Clean Water Act  
 MADEP = Massachusetts Department of Environmental Protection  
 MGL = Massachusetts General Laws  
 NPDES = National Pollutant Discharge Elimination System  
 USACE = U.S. Army Corps of Engineers  
 USC = United States Code



**TABLE 6-1**  
**POTENTIAL REMEDIAL TECHNOLOGIES**  
**AND DEBRIS PROCESS OPTIONS**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| GENERAL RESPONSE ACTION | REMEDIAL TECHNOLOGY                  | DEBRIS PROCESS OPTION                |
|-------------------------|--------------------------------------|--------------------------------------|
| No Action               | None                                 | Not Applicable                       |
| Removal                 | Surface Debris Removal<br>Excavation | Surface Debris Removal<br>Excavation |
| Disposal                | On Site                              | Landfilling                          |
| Containment             | Capping                              | Landfill Closure                     |

**TABLE 6-2**  
**DESCRIPTION OF DEBRIS PROCESS OPTIONS**

**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| GENERAL RESPONSE ACTION/TECHNOLOGY                             | DESCRIPTION OF DEBRIS PROCESS OPTIONS                                                                                                                                      |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>No Action</u><br>None                                       | No action taken to remediate landfills.                                                                                                                                    |
| <u>Removal</u><br><br>Surface Debris Removal<br><br>Excavation | <br><u>Surface Debris Removal.</u> Remove only those wastes protruding through the land surface.<br><br><u>Excavation.</u> Remove waste source by excavating debris sites. |
| <u>Disposal</u><br><br>On Site                                 | <br><u>Landfilling.</u> Disposal of debris at on-site Consolidation Landfill.                                                                                              |
| <u>Containment</u><br><br>Capping                              | <br><u>Landfill Closure.</u> Close landfill with low-permeability cover system.                                                                                            |



TABLE 6-3  
SCREENING OF TECHNOLOGIES AND DEBRIS PROCESS OPTIONS  
LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| GENERAL RESPONSE ACTION/<br>PROCESS OPTION             | APPLICABILITY TO                                                                                                                                                                                        |                                                                                                                 | SCREENING<br>STATUS | COMMENTS                           |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---------------------|------------------------------------|
|                                                        | SITE-LIMITING<br>CHARACTERISTICS                                                                                                                                                                        | WASTE-LIMITING<br>CHARACTERISTICS                                                                               |                     |                                    |
| <u>No Action</u><br>None                               | None                                                                                                                                                                                                    | Does not remove threats posed by waste at the landfills.                                                        | Retained.           | Required for consideration by NCP. |
|                                                        | Easily implementable.                                                                                                                                                                                   |                                                                                                                 |                     |                                    |
| <u>Removal</u><br>Surface Debris Removal<br>Excavation | Compliance with wetlands regulations for some activities may be required.                                                                                                                               | None.                                                                                                           | Retained.           | Would be used selectively.         |
|                                                        | Access to some portions of debris sites may be difficult due to steep terrain.<br>Compliance with wetlands regulations would be required for some construction activities within debris disposal areas. | Effectively removes debris. Excavation of some debris may be difficult due to steep terrain or remote location. | Retained.           | Would be used extensively.         |

continued

TABLE 6-3  
SCREENING OF TECHNOLOGIES AND DEBRIS PROCESS OPTIONS  
LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| GENERAL RESPONSE ACTION/<br>PROCESS OPTION | APPLICABILITY TO                                                                                                                  |                                                                            | SCREENING<br>STATUS | COMMENTS                                                                          |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------|-----------------------------------------------------------------------------------|
|                                            | SITE-LIMITING<br>CHARACTERISTICS                                                                                                  | WASTE-LIMITING<br>CHARACTERISTICS                                          |                     |                                                                                   |
| <u>Disposal</u><br>Landfilling             | On-site space restrictions must be considered.<br>Must comply with Massachusetts solid waste regulations.                         | To the extent possible, debris must be recomacted to pre-excavated volume. | Retained.           | Only practical technology for debris disposal.                                    |
| <u>Containment</u><br>Capping              | Capping of some landfills would be difficult because of their locations on steep terrain or in low-lying areas near water bodies. | None.                                                                      | Retained.           | As defined by USEPA, capping is the Presumptive Remedy for solid waste landfills. |



**TABLE 7-1**  
**SUMMARY OF DEVELOPED LANDFILL REMEDIATION ALTERNATIVES**

**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| ALTERNATIVE       | ALTERNATIVE COMPONENT                                                |                       |                               |                                     |                   |
|-------------------|----------------------------------------------------------------------|-----------------------|-------------------------------|-------------------------------------|-------------------|
|                   | EXCAVATE/<br>CONSOLIDATE                                             | CAP-IN-PLACE          | EXCAVATE/<br>DISPOSE OFF-SITE | LIMITED REMOVAL<br>(SURFACE DEBRIS) | NO FURTHER ACTION |
| PA-1 <sup>1</sup> |                                                                      | AOCs 9, 11,<br>40, 41 | SAs 6, 12, 13                 |                                     |                   |
| PA-2 <sup>2</sup> | All seven<br>landfills<br>(near<br>Shepley's<br>Hill)                |                       |                               |                                     |                   |
| PA-3              | AOCs 9, 40,<br>41<br>SAs 6, 12,<br>13<br>(at North<br>Post Landfill) | AOC 11                |                               |                                     |                   |
| PA-4              | All seven<br>landfills (at<br>North Post<br>Landfill)                |                       |                               |                                     |                   |
| PA-5              | AOCs 40, 41<br>SAs 6, 12,<br>13<br>(near<br>Shepley's<br>Hill)       | AOCs 9, 11            |                               |                                     |                   |
| PA-6              | AOCs 9, 11,<br>41<br>SAs 6, 12,<br>13<br>(near<br>Shepley's<br>Hill) | AOC 40                |                               |                                     |                   |

continued

**TABLE 7-1  
SUMMARY OF DEVELOPED LANDFILL REMEDIATION ALTERNATIVES**

**LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA**

| ALTERNATIVE    | ALTERNATIVE COMPONENT           |                          |                               |                                            |                          |
|----------------|---------------------------------|--------------------------|-------------------------------|--------------------------------------------|--------------------------|
|                | EXCAVATE/<br>CONSOLIDATE        | CAP-IN-PLACE             | EXCAVATE/<br>DISPOSE OFF-SITE | LIMITED REMOVAL<br>(SURFACE DEBRIS)        | NO FURTHER ACTION        |
| 1 <sup>3</sup> |                                 |                          |                               |                                            | All seven disposal areas |
| 2              |                                 | AOCs 9, 40               |                               | AOC 11 - dispose under AOC 9 Cap           | AOC 41<br>SAs 6, 12, 13  |
| 3              |                                 | AOCs 9, 11, 40           |                               |                                            | AOC 41<br>SAs 6, 12, 13  |
| 4              | AOCs 9, 40                      |                          |                               | AOC 11 - dispose in consolidation landfill | AOC 41<br>SAs 6, 12, 13  |
| 5              | AOCs 9, 40                      | AOC 41<br>SAs 6, 12, 13  |                               | AOC 11 - dispose in consolidation landfill |                          |
| 6              | AOCs, 9, 11, 40                 | AOC 41<br>SAs 6, 12, 13  |                               |                                            |                          |
| 7              |                                 | All seven disposal areas |                               |                                            |                          |
| 8              | AOCs 9, 40, 41<br>SAs 6, 12, 13 |                          |                               | AOC 11 - dispose in consolidation landfill |                          |
| 9              | All seven disposal areas        |                          |                               |                                            |                          |

**Notes:**

<sup>1</sup> PA-1 = BCT Plan of Action (3/31/95), Option 1.

<sup>2</sup> Alternative PA-2 is identical to Alternative 9, and is eliminated from further discussion in this report.

<sup>3</sup> Alternatives 1 through 9 were developed by the BCT on December 9, 1996.



**TABLE 7-2**  
**PRELIMINARY SCREENING OF ALTERNATIVES**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| Alternative                                                                                  | Effectiveness                                                                                                                                                                                                                                                    | Implementability                                                                                                                           | Cost                                     | Status                                                                                               |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------------------------------------------------------------------|
| PA-1<br>Excavate/Dispose Offsite:<br>Sas 6, 12, 13<br><br>Cap-In-Place<br>AOCs 9, 11, 40, 41 | Human health and ecological risks would be eliminated at SAs 6, 12, and 13<br><br>Effectiveness of landfill caps would be measured by post-closure groundwater monitoring.<br><br>Damage to proposed cap at AOC 11 caused by Nashua River flooding is a concern. | Excavation, consolidation, and cap-in-place actions can be accomplished using standard construction procedures and conventional equipment. | Capital: Moderate<br>Operating: Moderate | Eliminated. Off-site disposal costs are too high compared to disposal options in other alternatives. |
| PA-2                                                                                         | Identical to Alternative 9                                                                                                                                                                                                                                       | Eliminated from Further Discussion.                                                                                                        |                                          |                                                                                                      |

continued

TABLE 7-2  
PRELIMINARY SCREENING OF ALTERNATIVES  
LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| Alternative                                                                           | Effectiveness                                                                                                                                                                                    | Implementability                                                                                                                                                                                                                | Cost                                 | Status                                                                                                                     |
|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| PA-3<br>Consolidate at North Post<br>Landfill: AOCs 9, 40, 41<br>Sas 6, 12, 13        | Human health and<br>ecological risks would be<br>eliminated at AOCs 9, 40,<br>41, and SAs 6, 12, 13.                                                                                             | Excavation, consolidation,<br>and cap-in-place actions<br>can be accomplished using<br>standard construction<br>procedures and<br>conventional equipment.                                                                       | Capital: High<br>Operating: Moderate | Eliminated. Shepley's Hill<br>Landfill is preferable to<br>North Post Landfill as site<br>for consolidation landfill.      |
| Cap-In-Place: AOC 11                                                                  | Effectiveness of cap at<br>AOC 11 would be<br>measured by post-closure<br>groundwater monitoring.<br><br>Damage to proposed cap<br>at AOC 11 caused by<br>Nashua River flooding is a<br>concern. |                                                                                                                                                                                                                                 |                                      |                                                                                                                            |
| PA-4<br>Consolidate at North Post<br>Landfill: AOCs 9, 11, 40,<br>41<br>SAs 6, 12, 13 | Human health and<br>ecological risks would be<br>eliminated at the seven<br>landfills                                                                                                            | Excavation and<br>consolidation actions can<br>be accomplished using<br>standard construction<br>procedures and<br>conventional equipment.<br><br>30-year monitoring and<br>maintenance program<br>needed at only one landfill. | Capital: High<br>Operating: Moderate | Eliminated. Shepley's Hill<br>Landfill area is preferable to<br>North Post Landfill as site<br>for consolidation landfill. |



continued

TABLE 7-2  
PRELIMINARY SCREENING OF ALTERNATIVES  
LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| Alternative                                                                                                  | Effectiveness                                                                                                                                                                                                                                                                                         | Implementability                                                                                                                                          | Cost                                 | Status                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PA-5<br>Consolidate near<br>Shepley's Hill: AOCs 40,<br>41, and<br>SAs 6, 12, 13<br>Cap-in-Place: AOCs 9, 11 | Human health and<br>ecological risks would be<br>eliminated at AOCs 40, 41,<br>and SAs 6, 12, 13.<br><br>Effectiveness of caps at<br>AOCs 9 and 11 would be<br>measured by post-closure<br>groundwater monitoring.<br><br>Damage to cap at AOC 11<br>caused by Nashua River<br>flooding is a concern. | Excavation, consolidation,<br>and cap-in-place actions<br>can be accomplished using<br>standard construction<br>procedures and<br>conventional equipment. | Capital: High<br>Operating: Moderate | Eliminated. This alternative<br>contains different actions<br>for AOCs 9 and 40, the<br>landfills having the 2 largest<br>waste volumes. Thus,<br>economies of scale cannot<br>be realized. |
| PA-6<br>Consolidate near<br>Shepley's Hill: AOCs 9,<br>11, 41, and<br>SAs 6, 12, 13<br>Cap-in-Place AOC 40   | Human health and<br>ecological risks would be<br>eliminated at AOCs 9, 11,<br>41 and SAs 6, 12, 13.<br><br>Effectiveness of cap at<br>AOC 40 would be<br>measured by groundwater<br>monitoring.                                                                                                       | Excavation, consolidation,<br>and cap-in-place actions<br>can be accomplished using<br>standard construction<br>procedures and<br>conventional equipment. | Capital: High<br>Operating: Moderate | Eliminated. This alternative<br>contains different actions<br>for AOCs 9 and 40, the<br>landfills having the 2 largest<br>waste volumes. Thus,<br>economies of scale cannot<br>be realized. |

continued

TABLE 7-2  
PRELIMINARY SCREENING OF ALTERNATIVES  
LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| Alternative                                                                                           | Effectiveness                                                                                                                                                                                                                                                                                                                                                 | Implementability                                                                                                                                                                                                                                 | Cost                                   | Status    |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-----------|
| 1. No Further Action: All seven landfills.                                                            | Not to be evaluated using Screening Criteria.                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                  |                                        | Retained. |
| 2. No Further Action: AOC 41 and SAs 6, 12, 13<br>Limited Removal: AOC 11<br>Cap-in-place: AOCs 9, 40 | <p>Because the PRE did not identify significant human health or ecological risk, a low-permeability cap would provide only low risk - reduction benefit at AOC 9.</p> <p>Cap and monitoring at AOC 40 would mitigate and allow assessment of potential future release of contaminants to groundwater.</p> <p>Physical hazards would be removed at AOC 11.</p> | <p>Capping at AOCs 9 and 40, and limited removal at AOC 11 can be accomplished using standard construction procedures and conventional equipment.</p> <p>No implementability concerns for No Further Action at AOC 41 and SAs 6, 12, and 13.</p> | <p>Capital: Low<br/>Operating: Low</p> | Retained  |



continued

**TABLE 7-2**  
**PRELIMINARY SCREENING OF ALTERNATIVES**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| Alternative                                    | Effectiveness                                                                                                                                               | Implementability                                                                                                     | Cost                                     | Status    |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------|
| 3. No Further Action: AOC 41 and SAs 6, 12, 13 | Because significant human health or ecological risks were not identified at AOCs 9 and 11, a low-permeability cap would provide low risk-reduction benefit. | Capping at AOCs 9, 11, and 40 can be accomplished using standard construction procedures and conventional equipment. | Capital: Moderate<br>Operating: Moderate | Retained. |
| Cap-in-place: AOCs 9, 11, 40                   | Damage to cap at AOC 11 caused by Nashua River flooding is a concern.                                                                                       | No implementability concerns for No Further Action at AOC 41 and SAs 6, 12, and 13.                                  |                                          |           |

continued

TABLE 7-2  
PRELIMINARY SCREENING OF ALTERNATIVES  
LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| Alternative                                          | Effectiveness                                                             | Implementability                                                                                      | Cost                                | Status    |
|------------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------|-----------|
| 4. No Further Action:<br>AOC 41 and SAs 6, 12,<br>13 | Human health and<br>ecological risk would be<br>removed at AOCs 9 and 40. | Excavation and<br>consolidation of wastes at<br>AOCs 9 and 40, and limited<br>waste removal at AOC 11 | Capital: Moderate<br>Operating: Low | Retained. |
| Limited Removal:<br>AOC 11                           | Physical hazards would be<br>removed at AOC 11.                           | can be accomplished using<br>standard construction<br>procedures and<br>conventional equipment.       |                                     |           |
| Consolidate: AOCs 9,<br>40                           |                                                                           | UXO clearance activities<br>would be implemented<br>during waste excavations at<br>AOCs 9 and 40.     |                                     |           |
|                                                      |                                                                           | No implementability<br>concerns for No Further<br>Action at AOC 41 and SAs<br>6, 12, and 13.          |                                     |           |



continued

**TABLE 7-2**  
**PRELIMINARY SCREENING OF ALTERNATIVES**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| Alternative                            | Effectiveness                                                                                                                                                                    | Implementability                                                                                                                                            | Cost                                     | Status    |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------|
| 5. Limited Removal:<br>AOC 11          | Human health and ecological risk would be removed at AOCs 9 and 40.                                                                                                              | Excavation, consolidation, cap-in-place, and limited removal actions can be accomplished using standard construction procedures and conventional equipment. | Capital: Moderate<br>Operating: Moderate | Retained. |
| Cap-in-Place: AOC 41 and SAs 6, 12, 13 | Because significant human health and ecological risks were not identified at AOC 41 and SAs 6, 12, and 13, a low-permeability cap would provide only low risk-reduction benefit. |                                                                                                                                                             |                                          |           |
| Consolidate: AOCs 9, 40                | Physical hazards would be removed at AOC 11.                                                                                                                                     |                                                                                                                                                             |                                          |           |

continued

TABLE 7-2  
PRELIMINARY SCREENING OF ALTERNATIVES  
LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| Alternative                               | Effectiveness                                                                                                                                                                    | Implementability                                                                                                                           | Cost                                 | Status    |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------|
| 6. Cap-In-Place: AOC 41 and SAs 6, 12, 13 | Human health and environmental risks would be removed at AOCs 9, 11, and 40.                                                                                                     | Excavation, consolidation, and cap-in-place actions can be accomplished using standard construction procedures and conventional equipment. | Capital: High<br>Operating: Moderate | Retained. |
| Consolidate: AOCs 9, 11, 40               | Because significant human health and ecological risks were not identified at AOC 41 and SAs 6, 12, and 13, a low-permeability cap would provide only low risk-reduction benefit. |                                                                                                                                            |                                      |           |
|                                           | Erosion of a cap at SA 12 is a concern because of the site's steep terrain.                                                                                                      |                                                                                                                                            |                                      |           |



**TABLE 7-3**  
**SCREENING SUMMARY OF REMEDIAL ACTION ALTERNATIVES**

**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| <b>Remedial Action Alternative</b> |                                                                                                               | <b>Retained</b>   | <b>Eliminated</b> |
|------------------------------------|---------------------------------------------------------------------------------------------------------------|-------------------|-------------------|
| PA-1:                              | Cap-in-Place AOCs 9, 11, 40, 41<br>Excavate/Dispose Offsite SAs 6, 12, 13                                     |                   | X                 |
| PA-2:                              | Excavate/Consolidate AOCs 9, 11, 40, 41, and SAs 6, 12, 13 near Shepley's Hill                                | See Alternative 9 |                   |
| PA-3:                              | Excavate/Consolidate AOCs 9, 40, 41, and SAs 6, 12, 13 at North Post Landfill<br>Cap-in-Place AOC 11          |                   | X                 |
| PA-4:                              | Excavate/Consolidate AOCs 9, 11, 40, 41, and SAs 6, 12, 13 at North Post Landfill                             |                   | X                 |
| PA-5:                              | Excavate/Consolidate AOCs 40, 41, and SAs 6, 12, 13 near Shepley's Hill<br>Cap-in-Place AOCs 9, 11            |                   | X                 |
| PA-6:                              | Excavate/Consolidate AOCs 9, 11, 41 and SAs 6, 12, 13 near Shepley's Hill<br>Cap-in-Place AOC 40              |                   | X                 |
| 1:                                 | No Further Action at AOCs 9, 11, 40, 41, and SAs 6, 12, 13                                                    | X                 |                   |
| 2:                                 | No Further Action at AOC 41 and SAs 6, 12, 13<br>Limited Removal at AOC 11<br>Cap-in-Place AOCs 9, 40         | X                 |                   |
| 3:                                 | No Further Action at AOC 41 and SAs 6, 12, 13<br>Cap-in-Place AOCs 9, 11, 40                                  | X                 |                   |
| 4:                                 | No Further Action at AOC 41 and SAs 6, 12, 13<br>Limited Removal at AOC 11<br>Excavate/Consolidate AOCs 9, 40 | X                 |                   |
| 5:                                 | Limited Removal at AOC 11<br>Cap-in-Place AOC 41 and SAs 6, 12, 13<br>Excavate/Consolidate AOCs 9, 40         | X                 |                   |
| 6:                                 | Cap-in-Place AOC 41 and SAs 6, 12, 13<br>Excavate/Consolidate AOCs 9, 11, 40                                  | X                 |                   |
| 7:                                 | Cap-in-Place AOCs 9, 11, 40, 41 and SAs 6, 12, 13                                                             | X                 |                   |
| 8:                                 | Limited Removed at AOC 11<br>Excavate/Consolidate AOCs 9, 40, 41, and SAs 6, 12, 13                           | X                 |                   |
| 9:                                 | Excavate Consolidate AOCs 9, 11, 40, 41 and SAs 6, 12, 13                                                     | X                 |                   |

**TABLE 8-1**  
**ALTERNATIVE EVALUATION CRITERIA**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

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**THRESHOLD CRITERIA (must be met by each alternative)**

- OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT - Assesses how well an alternative, as a whole, achieves and maintains protection of human health and the environment.
- COMPLIANCE WITH ARARS - Assesses how the alternative complies with location-, chemical-, and action-specific ARARs, and whether a waiver is required or justified.

**PRIMARY CRITERIA (basis of alternative evaluation)**

- LONG-TERM EFFECTIVENESS AND PERMANENCE - Evaluates the effectiveness of the alternative in protecting human health and the environment after response objectives have been met. Includes consideration of the magnitude of residual risks and the adequacy and reliability of controls.
- REDUCTION OF TOXICITY, MOBILITY, AND VOLUME THROUGH TREATMENT - Evaluates the effectiveness of treatment processes used to reduce toxicity, mobility, and volume of hazardous substances. This criterion considers the degree to which treatment is irreversible, and the type and quantity of residuals remaining after treatment.
- SHORT-TERM EFFECTIVENESS - Examines the effectiveness of the alternative in protecting human health and the environment during the construction and implementation of a remedy until response objectives have been met. Considers the protection of the community, workers, and the environment during implementation of remedial actions.
- IMPLEMENTABILITY - Assesses the technical and administrative feasibility of an alternative and availability of required goods and services. Technical feasibility considers the ability to construct and operate a technology and its reliability, the ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of a remedy. Administrative feasibility considers the ability to obtain approvals from other parties or agencies and extent of required coordination with other parties or agencies.
- COST - Evaluates the capital and operation and maintenance cost of each alternative.

**BALANCING CRITERIA**

- STATE ACCEPTANCE - This criterion considers the state's preferences among or concerns about alternatives.
  - COMMUNITY ACCEPTANCE - This criterion considers the communities preferences among or concerns about alternatives.
-



**TABLE 8-2**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 2**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC | REQUIREMENT                                                              | STATUS                                  | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                      |
|----------------------|-------------------------|--------------------------------------------------------------------------|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Floodplains             | Floodplain Management Executive Order No. 11988 [40 CFR Part 6, App. A]  | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain. | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |
|                      | Wetlands                | Protection of Wetlands Executive Order No. 11990 [40 CFR Part 6, App. A] | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.                                                                                                         | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |

TABLE 8-2  
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 2  
  
LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                | REQUIREMENT                                                                                 | STATUS                                  | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                           |
|----------------------|----------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Wetlands<br>Aquatic Ecosystem          | Clean Water Act, Dredge or Fill Requirements Section 404 [33 CFR Part 230; 40 CFR Part 230] | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | Section 404 of the Clean Water Act regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a discharge of fill materials. Procedures for complying with regulatory conditions are contained in 33 CFR Part 323. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under Clean Water Act Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands. | The removal of drums/sediments and cover installation will be designed to minimize placement of fill in wetland areas. If this alternative is chosen, the affected areas will be restored to the extent necessary. |
|                      | Construction over/in navigable waters. | Rivers and Harbors Act of 1899 [33 USC 401 et seq.]                                         | Applicable<br>AOC 40                    | Section 10 of the Rivers and Harbors Act of 1899 requires an authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers (USACE), for the construction of any structure in or over any "navigable water of the U.S."; the excavation from or deposition of material in such waters, or any obstruction of alteration in such waters.                                                                                                                                                                                                                                                                                                                                             | Excavating, filling, and disposal activities will be conducted to meet the substantive criteria and standards of these regulations.                                                                                |



TABLE 8-2  
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 2

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                                   | REQUIREMENT                                                              | STATUS                                                | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                     |
|----------------------|-----------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Surface Waters<br>Endangered Species<br>Migratory Species | Fish and Wildlife Coordination Act [16 USC 661 et seq.; 40 CFR Part 302] | Applicable<br>AOC 9<br>AOC 11<br>AOC 40               | Actions that affect species/habitat require consultation with U.S. Department of Interior, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions.<br>Under 40 CFR Part 300.38, these requirements apply to all response activities under the National Contingency Plan. | To the extent necessary, actions will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The U.S. Fish and Wildlife Service, acting as a review agency for the USEPA, will be kept informed of proposed remedial actions. |
|                      | Endangered Species                                        | Endangered Species Act [16 USC 1531 et seq.; 50 CFR Part 402]            | Relevant and Appropriate<br>AOC 9<br>AOC 11<br>AOC 40 | This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | The protection of endangered species and their habitat will be considered during excavation activities and cover installation.                                                                                                                                                               |
|                      | Atlantic Flyway Wetlands<br>Surface Waters                | Migratory Bird Treaty Act (16 USC 703-711)                               | Applicable<br>AOC 11                                  | The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | The protection of endangered species and their habitat will be considered during excavation activities and cover installation.                                                                                                                                                               |

TABLE 8-2  
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 2  
  
LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                   | REQUIREMENT                                                                                                 | STATUS                                  | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                            |
|----------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Floodplains<br>Wetlands<br>Surface Waters | Massachusetts Wetland Protection Act and regulations [MGL c. 131 s. 40; 310 CMR 10.00]                      | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year floodplain). A Notice of Intent (NOI) must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons. | All work to be performed within wetlands and the 100 foot buffer zone will be in accordance with the substantive requirements of these regulations. |
|                      | Construction over/in a waterway.          | Massachusetts Waterways Act [MGL c. 91; 310 CMR 9.00]                                                       | Relevant and Appropriate<br>AOC 40      | The Massachusetts Waterways Act and regulations require that a license from Massachusetts Department of Environmental Protection (MADEP) be obtained for any work in or over any tidelands, river or stream (with respect to which public funds have been expended), or great pond, or outlet thereof.                                                                                                                                                                                                                                                                                                                                                  | Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations                                  |
| State                | Endangered Species                        | Massachusetts Endangered Species Act and implementing regulations [MGL c. 131A, s. 1 et seq.; 321 CMR 8.00] | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.                                                                                                                                                                                                                                                                                                                                                                                                                                                      | The protection of state listed endangered species will be considered during the design and implementation of this alternative.                      |



**TABLE 8-2**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 2**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC | REQUIREMENT                          | STATUS            | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                       |
|----------------------|-------------------------|--------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| State                | Nashua River            | Scenic Rivers Act [MGL c. 21 s. 27B] | Applicable AOC 11 | As part of the Massachusetts Department of Environmental Management's Scenic Rivers Program, the Nashua River and contiguous land up to 100 yards on each side of its natural banks are afforded special protection under this law. | Remedial activities will be performed to comply with the substantive requirements of this act. |

**Notes:**

CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Regulations  
 CWA = Clean Water Act  
 DOI = Department of the Interior  
 FWS = Fish and Wildlife Service  
 MEPA = Massachusetts Environmental Policy Act  
 MGL = Massachusetts General Laws  
 NMFS = National Marine Fisheries Service  
 USC = United States Code

**TABLE 8-3**  
**SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 2**

**LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA**

| <b>REGULATORY AUTHORITY</b> | <b>CHEMICAL MEDIUM</b> | <b>REQUIREMENT</b>                                                                                                            | <b>STATUS</b>                  | <b>REQUIREMENT SYNOPSIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>ACTION TO BE TAKEN TO ATTAIN REQUIREMENT</b>                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal                     | Surface water          | Clean Water Act, Ambient Water Quality Criteria [40 CFR 131; Quality Criteria for Water 1986]                                 | Applicable<br>AOC 11<br>AOC 40 | Federal Ambient Water Quality Criteria (AWQC) include (1) health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and (2) acute and chronic toxicity values for the protection of aquatic life. AWQC for the protection of human health provide protective concentrations for exposure from ingesting contaminated water and contaminated aquatic organisms, and from ingesting contaminated aquatic organisms alone. Remedial actions involving contaminated surface water or discharge of contaminants to surface water must consider the uses of the water and the circumstances of the release or threatened release. | Remedial actions will be performed in a manner to prevent AWQC exceedances in surface water. Activates at AOC 11 will be performed to prevent AWQC exceedances in the Nashua River. Removal of sediment at AOC 40 will be performed in a manner to prevent AWQC exceedances in Cold Spring Brook Pond. Supernatant from dredged spoil will be monitored to prevent AWQC exceedances in Cold Spring Brook Pond. |
|                             | Groundwater            | Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.53] | Applicable<br>AOC 40           | The National Primary Drinking Water Act establishes Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health based goals set equal to or lower than MCLs.                                            | At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average conditions, and the MCL for arsenic will be met under average and maximum conditions. MCLs are not exceeded at Patton Well.                                                                                                                                                                                                         |



TABLE 8-3  
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 2  
LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                  | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------|-----------------|--------------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Surface water   | Massachusetts Surface Water Quality Standards [314 CMR 4.00] | Applicable<br>AOC 11<br>AOC 40 | Massachusetts Surface Water Quality Standards designate the most sensitive uses for which surface waters of the Commonwealth are to be enhanced, maintained, and protected, and designate minimum water quality criteria for sustaining the designated uses. Surface waters at Fort Devens are classified as Class B. Surface waters are assigned to this class are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. These criteria supersede federal AWQC only when they are more stringent (more protective) than the AWQC. | At AOC 11 activities will be performed in a manner to prevent exceedances of surface water quality in the Nashua River.<br><br>At AOC 40 sediment removal will be performed in a manner to prevent exceedances of Surface Water Quality Standards in Cold Spring Brook Pond. Supernatant from dredged spoil dewatering will be monitored to prevent exceedances in the pond. To the extent necessary, Surface Water Quality Standards will be used to develop discharge limitations. |

**Notes:**

AWQC = Ambient Water Quality Criteria  
 CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act  
 CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Rules  
 CWA = Clean Water Act  
 MCL = Maximum Contaminant Level  
 MCLG = Maximum Contaminant Level Goal  
 MMCL = Massachusetts Maximum Contaminant Level  
 NPDWR = National Primary Drinking Water Regulations  
 SDWA = Safe Drinking Water Act  
 SMCL = Secondary Maximum Contaminant Level

**TABLE 8-4**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 2**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION                                                                        | REQUIREMENT                                                                                         | STATUS                                                                                                  | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                 | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                     |
|----------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Control of surface water runoff. Direct discharge to surface water.           | Clean Water Act Program (40 CFR 122.125)                                                            | Applicable<br>AOC 9<br>AOC 11<br>AOC 40                                                                 | The National Pollutant Discharge Elimination System (NPDES) permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to waters of the United States.                                                                                                                        | Construction activities will be controlled to meet USEPA discharge requirements. On-site discharges will meet the substantive requirements of these regulations.                                                                                             |
|                      | Land Disposal of Hazardous Wastes.                                            | Resource Conservation and Recovery Act (RCRA), Land Disposal Restrictions (LDRs); (40 CFR Part 268) | Applicable<br>AOC 9<br>AOC 11<br>AOC 40                                                                 | Land disposal of RCRA hazardous wastes without specified treatment is restricted. Remedial actions must be evaluated to determine if they constitute "placement" and if LDRs are applicable. The LDRs require that wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility. | If it is determined that materials excavated from AOCs 9, 11, or 40 are hazardous materials subject to LDRs, the materials will be handled and disposed of in compliance with these regulations.                                                             |
| State                | Solid Waste Landfill Construction, Operation, Closure, and Post-Closure Care. | Massachusetts Solid Waste Management Regulations [310 CMR 19.100]                                   | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>Relevant and Appropriate<br>SA 6<br>SA 13<br>AOC 40<br>AOC 41 | These regulations outline the requirements for construction, operation, closure, and post-closure at solid waste management facilities in the Commonwealth of Massachusetts.                                                                                                                                                                                         | The pertinent site investigation, and feasibility study reports and record of decision will be submitted to satisfy the requirements of 310 CMR 19.021 for submittal for final closure and post-closure plans at inactive landfills SA 6, SA 13, and AOC 41. |



**TABLE 8-4**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 2**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION                                                    | REQUIREMENT                                                                             | STATUS                          | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                   | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State<br>(continued) |                                                           |                                                                                         |                                 |                                                                                                                                                                                                                                                                                                                                                                        | <p>The requirements of 310 CMR 19.021 will not be satisfied for SA 12.</p> <p>Final closure and post-closure plans will be prepared and submitted to satisfy the requirements of 310 CMR 19.021 for AOCs 9, 11, and 40.</p> <p>The proposed landfill cover at AOC 9 will meet the requirements of 310 CMR 19.112.</p> <p>The proposed cover at AOC 40 will conform with the intent of 310 CMR 19.112, although it may be considered an Alternative Cover System Design by MADEP (310 CMR 19.113).</p> <p>Long-term monitoring and maintenance plans which meet the requirements of 310 CMR 19.118, 19.132, and 19.142 will be developed for AOCs 9 and 40.</p> <p>A Record Notice of Landfill Operation will be filed for AOCs 9, 11, and 40 in accordance with 310 CMR 19.141.</p> |
|                      | Activities that potentially affect surface water quality. | Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00] | Relevant and Appropriate AOC 40 | <p>For activities that require a MADEP Wetlands Order of Conditions to dredge or fill navigable waters or wetlands, a Chapter 91 Waterways License, a USACE permit or any major permit issued by USEPA (e.g., Clean Water Act NPDES permit), a Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00.</p> | Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to attain and maintain Massachusetts Water Quality Standards in affected waters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

**TABLE 8-4**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 2**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION | REQUIREMENT                                                    | STATUS                                  | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                       |
|----------------------|--------|----------------------------------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                |        | Massachusetts Air Pollution Control Regulations [310 CMR 7.00] | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | These regulations pertain to the prevention of emissions in excess of Massachusetts or national ambient air quality standards or in excess of emission limitations in those regulations. Specifically, Section 6.04 governs ambient air quality such as particulate matter standards. Emissions from site treatment activities must be maintained at an annual geometric mean of 75 g/m <sup>3</sup> and a maximum 24-hour concentration of 40 mg/m <sup>3</sup> (primary standard). Carbon monoxide, nitrogen dioxide, and lead are also regulated. Section 7.02 governs plan approval and emissions limitations. A permit and BACT are required prior to operation. Under Section 7.02, visible emissions are limited. Additionally, the Massachusetts toxic air pollutant (TAP) control program requirements will be considered. | Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18). |

**Notes:**

CFR = Code of Federal Regulations  
CMR = Code of Massachusetts Rules  
CWA = Clean Water Act  
MADEP = Massachusetts Department of Environmental Protection  
MGL = Massachusetts General Laws  
NPDES = National Pollutant Discharge Elimination System  
USACE = U.S. Army Corps of Engineers  
USC = United States Code



**TABLE 8 - 5**  
**COST SUMMARY TABLE**  
**ALTERNATIVE 2: NO FURTHER ACTION AT SAs 6, 12, 13, AOC 41;**  
**LIMITED REMOVAL AT AOC 11;**  
**CAP IN PLACE AOCs 9 & 40**

**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| ITEM                                                   | TOTAL COST   |
|--------------------------------------------------------|--------------|
| <b>DIRECT COSTS</b>                                    |              |
| NO FURTHER ACTION                                      |              |
| SA 6                                                   | \$ 0         |
| SA 12                                                  | 0            |
| SA 13                                                  | 0            |
| AOC 41                                                 | 0            |
| LIMITED REMOVAL AT AOC 11                              | 44,000       |
| CAP IN PLACE                                           |              |
| AOC 9                                                  | 3,301,000    |
| AOC 40                                                 | 1,758,000    |
| <b>TOTAL DIRECT COSTS</b>                              | \$ 5,103,000 |
| <b>INDIRECT COSTS</b>                                  |              |
| HEALTH AND SAFETY                                      | \$ 255,000   |
| LEGAL, ADMIN, PERMITTING                               | 255,000      |
| ENGINEERING                                            | 510,000      |
| SERVICES DURING CONSTRUCTION                           | 510,000      |
| <b>TOTAL INDIRECT COSTS</b>                            | \$ 1,530,000 |
| <b>TOTAL CAPITAL (DIRECT + INDIRECT) COSTS</b>         | \$ 6,633,000 |
| <b>OPERATION AND MAINTENANCE COSTS</b>                 |              |
| TOTAL ANNUAL O&M COSTS FOR AOC 11 - 2 YRS              | \$ 4,000     |
| TOTAL ANNUAL O&M COSTS FOR CAP-IN-PLACE AREAS - 30 YRS | 72,000       |
| TOTAL ADDITIONAL ANNUAL O&M COSTS FOR AOC 40 - 5 YRS   | 13,000       |
| <b>TOTAL PRESENT WORTH OF O&amp;M COSTS</b>            | \$ 953,000   |
| <b>TOTAL COSTS ALTERNATIVE 2</b>                       | \$ 7,586,000 |

TABLE 8-6  
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 3

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC | REQUIREMENT                                                              | STATUS                                  | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                      |
|----------------------|-------------------------|--------------------------------------------------------------------------|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Floodplains             | Floodplain Management Executive Order No. 11988 [40 CFR Part 6, App. A]  | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain. | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |
|                      | Wetlands                | Protection of Wetlands Executive Order No. 11990 [40 CFR Part 6, App. A] | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.                                                                                                         | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |



**TABLE 8-6**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 3**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                | REQUIREMENT                                                                                 | STATUS                                  | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                           |
|----------------------|----------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Wetlands<br>Aquatic Ecosystem          | Clean Water Act, Dredge or Fill Requirements Section 404 [33 CFR Part 230; 40 CFR Part 230] | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | Section 404 of the Clean Water Act regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a discharge of fill materials. Procedures for complying with regulatory conditions are contained in 33 CFR Part 323. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under Clean Water Act Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands. | The removal of drums/sediments and cover installation will be designed to minimize placement of fill in wetland areas. If this alternative is chosen, the affected areas will be restored to the extent necessary. |
| Federal              | Construction over/in navigable waters. | Rivers and Harbors Act of 1899 [33 USC 401 et seq.]                                         | Applicable<br>AOC 40                    | Section 10 of the Rivers and Harbors Act of 1899 requires an authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers (USACE), for the construction of any structure in or over any "navigable water of the U.S."; the excavation from or deposition of material in such waters, or any obstruction of alteration in such waters.                                                                                                                                                                                                                                                                                                                                             | Excavating, filling, and disposal activities will be conducted to meet the substantive criteria and standards of these regulations.                                                                                |

TABLE 8-6  
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 3

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                                   | REQUIREMENT                                                              | STATUS                                                | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                     |
|----------------------|-----------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Surface Waters<br>Endangered Species<br>Migratory Species | Fish and Wildlife Coordination Act [16 USC 661 et seq.; 40 CFR Part 302] | Applicable<br>AOC 9<br>AOC 11<br>AOC 40               | Actions that affect species/habitat require consultation with U.S. Department of Interior, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions.<br>Under 40 CFR Part 300.38, these requirements apply to all response activities under the National Contingency Plan. | To the extent necessary, actions will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The U.S. Fish and Wildlife Service, acting as a review agency for the USEPA, will be kept informed of proposed remedial actions. |
|                      | Endangered Species                                        | Endangered Species Act [16 USC 1531 et seq.; 50 CFR Part 402]            | Relevant and Appropriate<br>AOC 9<br>AOC 11<br>AOC 40 | This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | The protection of endangered species and their habitat will be considered during excavation activities and cover installation.                                                                                                                                                               |
|                      | Atlantic Flyway Wetlands<br>Surface Waters                | Migratory Bird Treaty Act (16 USC 703-711)                               | Applicable<br>AOC 11                                  | The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Remedial actions will be performed to protect migratory birds, their nests, and eggs.                                                                                                                                                                                                        |



TABLE 8-6  
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 3

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                   | REQUIREMENT                                                                                                 | STATUS                                  | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                            |
|----------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Floodplains<br>Wetlands<br>Surface Waters | Massachusetts Wetland Protection Act and regulations [MGL c. 131 s. 40; 310 CMR 10.00]                      | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year floodplain). A Notice of Intent (NOI) must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons. | All work to be performed within wetlands and the 100 foot buffer zone will be in accordance with the substantive requirements of these regulations. |
|                      | Construction over/in a waterway.          | Massachusetts Waterways Act [MGL c. 91; 310 CMR 9.00]                                                       | Relevant and Appropriate<br>AOC 40      | The Massachusetts Waterways Act and regulations require that a license from Massachusetts Department of Environmental Protection (MADEP) be obtained for any work in or over any tidelands, river or stream (with respect to which public funds have been expended), or great pond, or outlet thereof.                                                                                                                                                                                                                                                                                                                                                  | Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations                                  |
|                      | Endangered Species                        | Massachusetts Endangered Species Act and implementing regulations [MGL c. 131A, s. 1 et seq.; 321 CMR 8.00] | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.                                                                                                                                                                                                                                                                                                                                                                                                                                                      | The protection of state listed endangered species will be considered during the design and implementation of this alternative.                      |

TABLE 8-6  
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 3

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC | REQUIREMENT                          | STATUS            | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                       |
|----------------------|-------------------------|--------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| State                | Nashua River            | Scenic Rivers Act [MGL c. 21 s. 27B] | Applicable AOC 11 | As part of the Massachusetts Department of Environmental Management's Scenic Rivers Program, the Nashua River and contiguous land up to 100 yards on each side of its natural banks are afforded special protection under this law. | Remedial activities will be performed to comply with the substantive requirements of this act. |

Notes:

CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Regulations  
 CWA = Clean Water Act  
 DOI = Department of the Interior  
 FWS = Fish and Wildlife Service  
 MEPA = Massachusetts Environmental Policy Act  
 MGL = Massachusetts General Laws  
 NMFS = National Marine Fisheries Service  
 USC = United States Code



TABLE 8-7  
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 3

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                                                                                   | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Surface water   | Clean Water Act, Ambient Water Quality Criteria [40 CFR 131; Quality Criteria for Water 1986]                                 | Applicable<br>AOC 11<br>AOC 40 | Federal Ambient Water Quality Criteria (AWQC) include (1) health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and (2) acute and chronic toxicity values for the protection of aquatic life. AWQC for the protection of human health provide protective concentrations for exposure from ingesting contaminated water and contaminated aquatic organisms, and from ingesting contaminated aquatic organisms alone. Remedial actions involving contaminated surface water or discharge of contaminants to surface water must consider the uses of the water and the circumstances of the release or threatened release. | Remedial actions will be performed in a manner to prevent AWQC exceedances in surface water. Activates at AOC 11 will be performed to prevent AWQC exceedances in the Nashua River. Removal of sediment at AOC 40 will be performed in a manner to prevent AWQC exceedances in Cold Spring Brook Pond. Supernatant from dredged spoil will be monitored to prevent AWQC exceedances in Cold Spring Brook Pond. |
|                      | Groundwater     | Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.53] | Applicable<br>AOC 40           | The National Primary Drinking Water Act establishes Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health based goals set equal to or lower than MCLs.                                            | At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average conditions, and the MCL for arsenic will be met under average and maximum conditions. MCLs are not exceeded at Patton Well.                                                                                                                                                                                                         |

TABLE 8-7  
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 3

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                  | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------|-----------------|--------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Surface water   | Massachusetts Surface Water Quality Standards [314 CMR 4.00] | Applicable<br>AOC 11<br>AOC 40 | Massachusetts Surface Water Quality Standards designate the most sensitive uses for which surface waters of the Commonwealth are to be enhanced, maintained, and protected, and designate minimum water quality criteria for sustaining the designated uses. Surface waters at Fort Devens are classified as Class B. Surface waters assigned to this class are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. These criteria supersede federal AWQC only when they are more stringent (more protective) than the AWQC. | At AOC 11 activities will be performed in a manner to prevent exceedances of surface water quality in the Nashua River.<br><br>At AOC 40 sediment removal will be performed in a manner to prevent exceedances of Surface Water Quality Standards in Cold Spring Brook Pond. Supernatant from dredged spoil dewatering will be monitored to prevent exceedances in the pond. To the extent necessary, Surface Water Quality Standards will be used to develop discharge limitations. |

Notes:

|        |   |                                                                       |
|--------|---|-----------------------------------------------------------------------|
| AWQC   | = | Ambient Water Quality Criteria                                        |
| CERCLA | = | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR    | = | Code of Federal Regulations                                           |
| CMR    | = | Code of Massachusetts Rules                                           |
| CWA    | = | Clean Water Act                                                       |
| MCL    | = | Maximum Contaminant Level                                             |
| MCLG   | = | Maximum Contaminant Level Goal                                        |
| MMCL   | = | Massachusetts Maximum Contaminant Level                               |
| NPDWR  | = | National Primary Drinking Water Regulations                           |
| SDWA   | = | Safe Drinking Water Act                                               |
| SMCL   | = | Secondary Maximum Contaminant Level                                   |



**TABLE 8-8**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 3**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION                                                                        | REQUIREMENT                                                                                         | STATUS                                                                                                   | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                 | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Control of surface water runoff.<br>Direct discharge to surface water.        | Clean Water Act Program [40 CFR 122.125]                                                            | Applicable<br>AOC 9<br>AOC 11<br>AOC 40                                                                  | The National Pollutant Discharge Elimination System (NPDES) permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to waters of the United States.                                                                                                                        | Construction activities will be controlled to meet USEPA discharge requirements. On-site discharges will meet the substantive requirements of these regulations.                                                                                                                                                                                                                                                                     |
|                      | Land Disposal of Hazardous Wastes.                                            | Resource Conservation and Recovery Act (RCRA), Land Disposal Restrictions (LDRs); (40 CFR Part 268) | Applicable<br>AOC 9<br>AOC 11<br>AOC 40                                                                  | Land disposal of RCRA hazardous wastes without specified treatment is restricted. Remedial actions must be evaluated to determine if they constitute "placement" and if LDRs are applicable. The LDRs require that wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility. | If it is determined that materials excavated from AOCs 9, 11, or 40 are hazardous materials subject to LDRs, the materials will be handled and disposed of in compliance with these regulations.                                                                                                                                                                                                                                     |
| State                | Solid Waste Landfill Construction, Operation, Closure, and Post-Closure Care. | Massachusetts Solid Waste Management Regulations [310 CMR 19.100]                                   | Applicable<br>AOC 9<br>AOC 11<br>AOC 12<br>Relevant and Appropriate<br>SA 6<br>SA 13<br>AOC 40<br>AOC 41 | These regulations outline the requirements for construction, operation, closure, and post-closure at solid waste management facilities in the Commonwealth of Massachusetts.                                                                                                                                                                                         | The pertinent site investigation, remedial investigation, and feasibility study reports and record of decision will be submitted to satisfy the requirements of 310 CMR 19.021 for submittal of final closure and post-closure plans at inactive landfills SA 6, SA 13, and AOC 41.<br><br>Final closure and post-closure plans will be prepared and submitted to satisfy the requirements of 310 CMR 19.021 for AOCs 9, 11, and 40. |

TABLE 8-8  
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 3

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | ACTION                                                    | REQUIREMENT                                                                             | STATUS                          | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                            | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State<br>(continued) |                                                           |                                                                                         |                                 |                                                                                                                                                                                                                                                                                                                                                                 | <p>The requirements of 310 CMR 19.021 will not be satisfied for SA 12.</p> <p>The proposed landfill cover at AOC 9 will meet the requirements of 310 CMR 19.112.</p> <p>The proposed landfill cover at AOC 11 will meet the requirements of 310 CMR 19.112.</p> <p>The proposed landfill cover at AOC 40 will conform with the intent of 310 CMR 19.112 although it may be considered an Alternative Cover System Design by MADEP (310 CMR 19.113).</p> <p>Long-term monitoring and maintenance plans which meet the requirements of 310 CMR 19.118, 19.132, 19.133, and 19.142 will be developed for AOCs 9, 11, and 40.</p> <p>A Record Notice of Landfill Operation will be filed for AOCs 9, 11, and 40 in accordance with 310 CMR 19.141.</p> |
|                      | Activities that potentially affect surface water quality. | Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00] | Relevant and Appropriate AOC 40 | For activities that require a MADEP Wetlands Order of Conditions to dredge or fill navigable waters or wetlands, a Chapter 91 Waterways License, a USACE permit or any major permit issued by USEPA (e.g., Clean Water Act NPDES permit), a Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00. | Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to attain and maintain Massachusetts Water Quality Standards in affected waters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |



**TABLE 8-8**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 3**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION | REQUIREMENT                                                    | STATUS                                  | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                       |
|----------------------|--------|----------------------------------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                |        | Massachusetts Air Pollution Control Regulations [310 CMR 7.00] | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | These regulations pertain to the prevention of emissions in excess of Massachusetts or national ambient air quality standards or in excess of emission limitations in those regulations. Specifically, Section 6.04 governs ambient air quality such as particulate matter standards. Emissions from site treatment activities must be maintained at an annual geometric mean of 75 g/m <sup>3</sup> and a maximum 24-hour concentration of 40 mg/m <sup>3</sup> (primary standard). Carbon monoxide, nitrogen dioxide, and lead are also regulated. Section 7.02 governs plan approval and emissions limitations. A permit and BACT are required prior to operation. Under Section 7.02, visible emissions are limited. Additionally, the Massachusetts toxic air pollutant (TAP) control program requirements will be considered. | Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18). |

**Notes:**

CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Rules  
 CWA = Clean Water Act  
 MADEP = Massachusetts Department of Environmental Protection  
 MGL = Massachusetts General Laws  
 NPDES = National Pollutant Discharge Elimination System  
 USACE = U.S. Army Corps of Engineers  
 USC = United States Code

**TABLE 8 - 9**  
**COST SUMMARY TABLE**  
**ALTERNATIVE 3: NO FURTHER ACTION AT SAs 6, 12, 13, AOC 41;**  
**CAP IN PLACE AOCs 9, 11, & 40**

**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| ITEM                                                 | TOTAL COST |
|------------------------------------------------------|------------|
| <b>DIRECT COSTS</b>                                  |            |
| NO FURTHER ACTION                                    |            |
| SA 6                                                 | \$ 0       |
| SA 12                                                | 0          |
| SA 13                                                | 0          |
| AOC 41                                               | 0          |
| CAP IN PLACE                                         |            |
| AOC 9                                                | 3,301,000  |
| AOC 11                                               | 1,269,000  |
| AOC 40                                               | 1,758,000  |
| <b>TOTAL DIRECT COSTS</b>                            |            |
| <b>\$ 6,328,000</b>                                  |            |
| <b>INDIRECT COSTS</b>                                |            |
| HEALTH AND SAFETY                                    | \$ 316,000 |
| LEGAL, ADMIN, PERMITTING                             | 316,000    |
| ENGINEERING                                          | 633,000    |
| SERVICES DURING CONSTRUCTION                         | 633,000    |
| <b>TOTAL INDIRECT COSTS</b>                          |            |
| <b>\$ 1,898,000</b>                                  |            |
| <b>TOTAL CAPITAL (DIRECT + INDIRECT) COSTS</b>       |            |
| <b>\$ 8,226,000</b>                                  |            |
| <b>OPERATION AND MAINTENANCE COSTS</b>               |            |
| TOTAL ANNUAL O&M COSTS FOR AOC 9, 11, 40 - 30 YRS    | \$ 99,000  |
| TOTAL ADDITIONAL ANNUAL O&M COSTS FOR AOC 40 - 5 YRS | 13,000     |
| <b>TOTAL PRESENT WORTH OF O&amp;M COSTS</b>          |            |
| <b>\$ 1,281,000</b>                                  |            |
| <b>TOTAL COSTS ALTERNATIVE 3</b>                     |            |
| <b>\$ 9,507,000</b>                                  |            |



**TABLE 8-10**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 4**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC    | REQUIREMENT                                                                                 | STATUS                                  | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                      |
|----------------------|----------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Floodplains                | Floodplain Management Executive Order No. 11988 [40 CFR Part 6, App. A]                     | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.                                                                                                                                                                                                                                       | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |
|                      | Wetlands                   | Protection of Wetlands Executive Order No. 11990 [40 CFR Part 6, App. A]                    | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.                                                                                                                                                                                                                                                                                                                                               | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |
|                      | Wetlands Aquatic Ecosystem | Clean Water Act, Dredge or Fill Requirements Section 404 [33 CFR Part 230; 40 CFR Part 230] | Applicable<br>AOC 9<br>AOC 11<br>AOC 40 | Section 404 of the Clean Water Act regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a discharge of fill materials. Procedures for complying with regulatory conditions are contained in 33 CFR Part 323. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under Clean Water Act Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands. | The removal of drums/sediments and cover installation will be designed to minimize placement of fill in wetland areas. If this alternative is chosen, the affected areas will be restored to the extent necessary.                                            |

**TABLE 8-10**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 4**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| <b>REGULATORY AUTHORITY</b> | <b>LOCATION CHARACTERISTIC</b>                            | <b>REQUIREMENT</b>                                                       | <b>STATUS</b>                                                                | <b>REQUIREMENT SYNOPSIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>ACTION TO BE TAKEN TO ATTAIN REQUIREMENT</b>                                                                                                                                                                                                                                              |
|-----------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal                     | Construction over/in navigable waters.                    | Rivers and Harbors Act of 1899 [33 USC 401 et seq.]                      | Applicable AOC 40                                                            | Section 10 of the Rivers and Harbors Act of 1899 requires an authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers (USACE), for the construction of any structure in or over any "navigable water of the U.S."; the excavation from or deposition of material in such waters, or any obstruction of alteration in such waters.                                                                                                                                                                                                                                                                                                                                                                                                                  | Excavating, filling, and disposal activities will be conducted to meet the substantive criteria and standards of these regulations.                                                                                                                                                          |
|                             | Surface Waters<br>Endangered Species<br>Migratory Species | Fish and Wildlife Coordination Act [16 USC 661 et seq.; 40 CFR Part 302] | Applicable AOC 9<br>AOC 11<br>AOC 40                                         | Actions that affect species/habitat require consultation with U.S. Department of Interior, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions.<br>Under 40 CFR Part 300.38, these requirements apply to all response activities under the National Contingency Plan. | To the extent necessary, actions will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The U.S. Fish and Wildlife Service, acting as a review agency for the USEPA, will be kept informed of proposed remedial actions. |
| Federal                     | Endangered Species                                        | Endangered Species Act [16 USC 1531 et seq.; 50 CFR Part 402]            | Relevant and Appropriate AOC 9<br>AOC 11<br>AOC 40<br>Consolidation Facility | This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | The protection of endangered species and their habitat will be considered during excavation activities and cover installation.                                                                                                                                                               |



**TABLE 8-10**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 4**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                 | REQUIREMENT                                                                                                 | STATUS                                                | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                             |
|----------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Atlantic Flyway Wetlands Surface Waters | Migratory Bird Treaty Act (16 USC 703-711)                                                                  | Applicable AOC 11                                     | The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Remedial actions will be performed to protect migratory birds, their nests, and eggs.                                                                                                                |
| State                | Floodplains Wetlands Surface Waters     | Massachusetts Wetland Protection Act and regulations [MGL c. 131 s. 40; 310 CMR 10.00]                      | Applicable AOC 9 AOC 11 AOC 40                        | These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year floodplain). A Notice of Intent (NOI) must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons. | All work to be performed within wetlands and the 100 foot buffer zone will be in accordance with the substantive requirements of these regulations.                                                  |
| State                | Construction over/in a waterway.        | Massachusetts Waterways Act [MGL c. 91; 310 CMR 9.00]                                                       | Relevant and Appropriate AOC 40                       | The Massachusetts Waterways Act and regulations require that a license from Massachusetts Department of Environmental Protection (MADEP) be obtained for any work in or over any tidelands, river or stream (with respect to which public funds have been expended), or great pond, or outlet thereof.                                                                                                                                                                                                                                                                                                                                                  | Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations                                                                                   |
| State                | Endangered Species                      | Massachusetts Endangered Species Act and implementing regulations [MGL c. 131A, s. 1 et seq.; 321 CMR 8.00] | Applicable AOC 9 AOC 11 AOC 40 Consolidation Facility | Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.                                                                                                                                                                                                                                                                                                                                                                                                                                                      | The protection of state listed endangered species (in particular the Grasshopper Sparrow at the Consolidation Facility) will be considered during the design and implementation of this alternative. |

**TABLE 8-10**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 4**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC | REQUIREMENT                          | STATUS            | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                       |
|----------------------|-------------------------|--------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| State                | Nashua River            | Scenic Rivers Act (MGL c. 21 s. 27B) | Applicable AOC 11 | As part of the Massachusetts Department of Environmental Management's Scenic Rivers Program, the Nashua River and contiguous land up to 100 yards on each side of its natural banks are afforded special protection under this law. | Remedial activities will be performed to comply with the substantive requirements of this act. |

**Notes:**

= Code of Federal Regulations  
 CFR = Code of Massachusetts Regulations  
 CMR = Clean Water Act  
 CWA = Department of the Interior  
 DOI = Fish and Wildlife Service  
 FWS = Massachusetts Environmental Policy Act  
 MEPA = Massachusetts General Laws  
 MGL = National Marine Fisheries Service  
 NMFS = United States Code  
 USC =



**TABLE 8-11**  
**SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 4**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                                                                                   | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Surface water   | Clean Water Act, Ambient Water Quality Criteria [40 CFR 131; Quality Criteria for Water 1986]                                 | Applicable<br>AOC 11<br>AOC 40 | Federal Ambient Water Quality Criteria (AWQC) include (1) health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and (2) acute and chronic toxicity values for the protection of aquatic life. AWQC for the protection of human health provide protective concentrations for exposure from ingesting contaminated water and contaminated aquatic organisms, and from ingesting contaminated aquatic organisms alone. Remedial actions involving contaminated surface water or discharge of contaminants to surface water must consider the uses of the water and the circumstances of the release or threatened release. | Remedial actions will be performed in a manner to prevent AWQC exceedances in surface water. Activates at AOC 11 will be performed to prevent AWQC exceedances in the Nashua River. Removal of sediment at AOC 40 will be performed in a manner to prevent AWQC exceedances in Cold Spring Brook Pond. Supernatant from dredged spoil will be monitored to prevent AWQC exceedances in Cold Spring Brook Pond. |
| Federal              | Groundwater     | Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.53] | Applicable<br>AOC 40           | The National Primary Drinking Water Act establishes Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health based goals set equal to or lower than MCLs.                                            | At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average conditions, and the MCL for arsenic will be met under average and maximum conditions. MCLs are not exceeded at Patton Well.                                                                                                                                                                                                         |

**TABLE 8-11**  
**SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 4**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                  | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------|-----------------|--------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Surface water   | Massachusetts Surface Water Quality Standards [314 CMR 4.00] | Applicable<br>AOC 11<br>AOC 40 | Massachusetts Surface Water Quality Standards designate the most sensitive uses for which surface waters of the Commonwealth are to be enhanced, maintained, and protected, and designate minimum water quality criteria for sustaining the designated uses. Surface waters at Fort Devens are classified as Class B. Surface waters assigned to this class are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. These criteria supersede federal AWQC only when they are more stringent (more protective) than the AWQC. | At AOC 11 activities will be performed in a manner to prevent exceedances of surface water quality in the Nashua River.<br><br>At AOC 40 sediment removal will be performed in a manner to prevent exceedances of Surface Water Quality Standards in Cold Spring Brook Pond. Supernatant from dredged spoil dewatering will be monitored to prevent exceedances in the pond. To the extent necessary, Surface Water Quality Standards will be used to develop discharge limitations. |

**Notes:**

= Ambient Water Quality Criteria  
 = Comprehensive Environmental Response, Compensation, and Liability Act  
 CERCLA = Code of Federal Regulations  
 CFR = Code of Massachusetts Rules  
 CMR = Clean Water Act  
 CWA = Maximum Contaminant Level  
 MCL = Maximum Contaminant Level Goal  
 MCLG = Massachusetts Maximum Contaminant Level  
 MMCL = National Primary Drinking Water Regulations  
 NPDRW = Safe Drinking Water Act  
 SDWA = Secondary Maximum Contaminant Level  
 SMCL =



TABLE 8-12  
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 4  
LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | ACTION                                                              | REQUIREMENT                                                                                         | STATUS                                                | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                 | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                         |
|----------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Control of surface water runoff. Direct discharge to surface water. | Clean Water Act Program [40 CFR 122.125]                                                            | Applicable AOC 9 AOC 11 AOC 40 Consolidation Facility | The National Pollutant Discharge Elimination System (NPDES) permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to waters of the United States.                                                                                                                        | Construction activities will be controlled to meet USEPA discharge requirements. On-site discharges will meet the substantive requirements of these regulations.                                 |
|                      | Land Disposal of Hazardous Wastes.                                  | Resource Conservation and Recovery Act (RCRA), Land Disposal Restrictions (LDRs); (40 CFR Part 268) | Applicable AOC 9 AOC 11 AOC 40                        | Land disposal of RCRA hazardous wastes without specified treatment is restricted. Remedial actions must be evaluated to determine if they constitute "placement" and if LDRs are applicable. The LDRs require that wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility. | If it is determined that materials excavated from AOCs 9, 11, or 40 are hazardous materials subject to LDRs, the materials will be handled and disposed of in compliance with these regulations. |
| State                | Solid Waste Landfill Siting.                                        | Massachusetts Solid Waste Facilities Site Regulations [310 CMR 16.00]                               | Applicable Consolidation Facility                     | These regulations outline the requirements for selecting the site of a new solid waste landfill in the Commonwealth of Massachusetts.                                                                                                                                                                                                                                | The consolidation facility will be sited in accordance with these regulations.                                                                                                                   |

**TABLE 8-12**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 4**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION                                                                        | REQUIREMENT                                                                             | STATUS                                                                                            | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                            | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Solid Waste Landfill Construction, Operation, Closure, and Post-Closure Care. | Massachusetts Solid Waste Management Regulations [310 CMR 19.100]                       | Applicable AOC 9<br>AOC 11<br>SA 12<br>Relevant and Appropriate SA 6<br>SA 13<br>AOC 40<br>AOC 41 | These regulations outline the requirements for construction, operation, closure, and post closure at solid waste management facilities in the Commonwealth of Massachusetts.                                                                                                                                                                                    | The pertinent site investigation, remedial investigation, and feasibility study reports and record of decision will be submitted to satisfy the requirements of 310 CMR 19.021 for submittal of final closure and post-closure plans at inactive landfills SA 6, SA 13, and AOC 41.<br><br>Final closure and post-closure plans will be prepared and submitted to satisfy the requirements of 310 CMR 19.021 for AOCs 9, 11, and 40.<br><br>The requirements of 310 CMR 19.021 will not be satisfied for SA 12.<br><br>The consolidation landfill will be constructed, operated, and closed in conformance with the regulations at 319 CMR 19.000.<br><br>A Record Notice of Landfill Operation will be filed for AOC 11 in accordance with 310 CMR 19.141. |
| State                | Activities that potentially affect surface water quality.                     | Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00] | Relevant and Appropriate AOC 40                                                                   | For activities that require a MADEP Wetlands Order of Conditions to dredge or fill navigable waters or wetlands, a Chapter 91 Waterways License, a USACE permit or any major permit issued by USEPA (e.g., Clean Water Act NPDES permit), a Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00. | Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to attain and maintain Massachusetts Water Quality Standards in affected waters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



**TABLE 8-12**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 4**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION | REQUIREMENT                                                    | STATUS                                                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                       |
|----------------------|--------|----------------------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                |        | Massachusetts Air Pollution Control Regulations [310 CMR 7.00] | Applicable AOC 9<br>AOC 11<br>AOC 40<br>Consolidation Facility | These regulations pertain to the prevention of emissions in excess of Massachusetts or national ambient air quality standards or in excess of emission limitations in those regulations. Specifically, Section 6.04 governs ambient air quality such as particulate matter standards. Emissions from site treatment activities must be maintained at an annual geometric mean of 75 g/m <sup>3</sup> and a maximum 24-hour concentration of 40 mg/m <sup>3</sup> (primary standard). Carbon monoxide, nitrogen dioxide, and lead are also regulated. Section 7.02 governs plan approval and emissions limitations. A permit and BACT are required prior to operation. Under Section 7.02, visible emissions are limited. Additionally, the Massachusetts toxic air pollutant (TAP) control program requirements will be considered. | Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18). |

**Notes:**

CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Rules  
 CWA = Clean Water Act  
 MADEP = Massachusetts Department of Environmental Protection  
 MGL = Massachusetts General Laws  
 NPDES = National Pollutant Discharge Elimination System  
 USACE = U.S. Army Corps of Engineers  
 USC = United States Code

**TABLE 8 - 13**  
**COST SUMMARY TABLE**  
**ALTERNATIVE 4: NO FURTHER ACTION AT SAs 6, 12, 13, AOC 41;**  
**LIMITED REMOVAL AT AOC 11;**  
**EXCAVATE AND CONSOLIDATE AOCs 9 & 40**

**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| ITEM                                                   | TOTAL COST           |
|--------------------------------------------------------|----------------------|
| <b>DIRECT COSTS</b>                                    |                      |
| NO FURTHER ACTION                                      |                      |
| SA 6                                                   | \$ 0                 |
| SA 12                                                  | 0                    |
| SA 13                                                  | 0                    |
| AOC 41                                                 | 0                    |
| LIMITED REMOVAL AT AOC 11                              | 44,000               |
| EXCAVATE AND CONSOLIDATE                               |                      |
| AOC 9                                                  | 3,835,000            |
| AOC 40                                                 | 3,370,000            |
| CONSOLIDATION LANDFILL CONSTRUCTION                    | 5,240,000            |
| <b>TOTAL DIRECT COSTS</b>                              | <b>\$ 12,489,000</b> |
| <b>INDIRECT COSTS</b>                                  |                      |
| HEALTH AND SAFETY                                      | \$ 624,000           |
| LEGAL, ADMIN, PERMITTING                               | 624,000              |
| ENGINEERING                                            | 1,249,000            |
| SERVICES DURING CONSTRUCTION                           | 1,249,000            |
| <b>TOTAL INDIRECT COSTS</b>                            | <b>\$ 3,746,000</b>  |
| <b>TOTAL CAPITAL (DIRECT + INDIRECT) COSTS</b>         | <b>\$ 16,235,000</b> |
| <b>OPERATION AND MAINTENANCE COSTS</b>                 |                      |
| TOTAL ANNUAL O&M COSTS FOR AOC 11 - 2 YRS              | \$ 4,000             |
| TOTAL ANNUAL O&M COSTS CONSOLIDATION LANDFILL - 30 YRS | 23,000               |
| TOTAL ADDITIONAL ANNUAL O&M COSTS FOR AOC 40 - 5 YRS   | 29,000               |
| <b>TOTAL PRESENT WORTH OF O&amp;M COSTS</b>            | <b>\$ 411,000</b>    |
| <b>TOTAL COSTS ALTERNATIVE 4</b>                       | <b>\$ 16,646,000</b> |



**TABLE 8-14**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 5**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                | REQUIREMENT                                                                                 | STATUS                                                              | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                      |
|----------------------|----------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Floodplains                            | Floodplain Management Executive Order No. 11988 [40 CFR Part 6, App. A]                     | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.                                                                                                                                                                                                                                       | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |
|                      | Wetlands                               | Protection of Wetlands Executive Order No. 11990 [40 CFR Part 6, App. A]                    | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.                                                                                                                                                                                                                                                                                                                                               | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |
| Federal              | Wetlands Aquatic Ecosystem             | Clean Water Act, Dredge or Fill Requirements Section 404 [33 CFR Part 230; 40 CFR Part 230] | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | Section 404 of the Clean Water Act regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a discharge of fill materials. Procedures for complying with regulatory conditions are contained in 33 CFR Part 323. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under Clean Water Act Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands. | The removal of drums/sediments and cover installation will be designed to minimize placement of fill in wetland areas. If this alternative is chosen, the affected areas will be restored to the extent necessary.                                            |
| Federal              | Construction over/in navigable waters. | Rivers and Harbors Act of 1899 [33 USC 401 et seq.]                                         | Applicable<br>AOC 40                                                | Section 10 of the Rivers and Harbors Act of 1899 requires an authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers (USACE), for the construction of any structure in or over any "navigable water of the U.S."; the excavation from or deposition of material in such waters, or any obstruction of alteration in such waters.                                                                                                                                                                                                                                                                                                                                             | Excavating, filling, and disposal activities will be conducted to meet the substantive criteria and standards of these regulations.                                                                                                                           |

**TABLE 8-14**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 5**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                                   | REQUIREMENT                                                              | STATUS                                                                                                               | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                     |
|----------------------|-----------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Surface Waters<br>Endangered Species<br>Migratory Species | Fish and Wildlife Coordination Act [16 USC 661 et seq.; 40 CFR Part 302] | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41                                                  | Actions that affect species/habitat require consultation with U.S. Department of Interior, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions.<br>Under 40 CFR Part 300.38, these requirements apply to all response activities under the National Contingency Plan. | To the extent necessary, actions will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The U.S. Fish and Wildlife Service, acting as a review agency for the USEPA, will be kept informed of proposed remedial actions. |
|                      | Endangered Species                                        | Endangered Species Act [16 USC 1531 et seq.; 50 CFR Part 402]            | Relevant and Appropriate<br>SA 6<br>AOC 9<br>AOC 11<br>AOC 12<br>SA 13<br>AOC 40<br>AOC 41<br>Consolidation Facility | This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | The protection of endangered species and their habitat will be considered during excavation activities and cover installation.                                                                                                                                                               |
| Federal              | Atlantic Flyway<br>Wetlands<br>Surface Waters             | Migratory Bird Treaty Act (16 USC 703-711)                               | Applicable<br>AOC 11                                                                                                 | The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Remedial actions will be performed to protect migratory birds, their nests, and eggs.                                                                                                                                                                                                        |
| Federal              | Archeological Sites                                       | Archeological Resources Protection Act of 1979 [16 USC 47099-11]         | Relevant and Appropriate<br>SA 6                                                                                     | This law prohibits the excavation, damage, alteration, and trade of archeological resources obtained illegally from public or Native American.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Remedial actions will be performed to prevent the illegal excavation, damage, alteration, or trade of archeological resources.                                                                                                                                                               |



**TABLE 8-14**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 5**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                   | REQUIREMENT                                                                                                                                               | STATUS                                                                                                | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                             |
|----------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Archeological and Historic Sites          | Archeological and Historic Data Preservation Act [16 USC 469-469c; 40 CFR 469; 40 CFR 6.301(c)] and National Historic Preservation Act [16 USC 470-470w6] | Applicable<br>SA 6                                                                                    | These laws establish the procedures for the inventory, registration, and preservation of historical and archeological resources. Such resources must be retrieved, preserved, and properly managed when terrain is altered as a result of a federal or federally licensed construction activity.                                                                                                                                                                                                                                                                                                                                                        | Remedial actions will be conducted to inventory, register, and preserve historical and archeological resources.                                                                                      |
| State                | Floodplains<br>Wetlands<br>Surface Waters | Massachusetts Wetland Protection Act and regulations [MGL c. 131 s. 40; 310 CMR 10.00]                                                                    | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41                                   | These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year floodplain). A Notice of Intent (NOI) must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons. | All work to be performed within wetlands and the 100 foot buffer zone will be in accordance with the substantive requirements of these regulations.                                                  |
| State                | Construction over/in a waterway.          | Massachusetts Waterways Act [MGL c. 91; 310 CMR 9.00]                                                                                                     | Relevant and Appropriate<br>AOC 40                                                                    | The Massachusetts Waterways Act and regulations require that a license from Massachusetts Department of Environmental Protection (MADEP) be obtained for any work in or over any tidelands, river or stream (with respect to which public funds have been expended), or great pond, or outlet thereof.                                                                                                                                                                                                                                                                                                                                                  | Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations                                                                                   |
| State                | Endangered Species                        | Massachusetts Endangered Species Act and implementing regulations [MGL c. 131A, s. 1 et seq.; 321 CMR 8.00]                                               | Applicable<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41<br>Consolidation Facility | Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.                                                                                                                                                                                                                                                                                                                                                                                                                                                      | The protection of state listed endangered species (in particular the Grasshopper Sparrow at the Consolidation Facility) will be considered during the design and implementation of this alternative. |

**TABLE 8-14**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 5**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC | REQUIREMENT                          | STATUS            | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                       |
|----------------------|-------------------------|--------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| State                | Nashua River            | Scenic Rivers Act [MGL c. 21 s. 27B] | Applicable AOC 11 | As part of the Massachusetts Department of Environmental Management's Scenic Rivers Program, the Nashua River and contiguous land up to 100 yards on each side of its natural banks are afforded special protection under this law. | Remedial activities will be performed to comply with the substantive requirements of this act. |

**Notes:**

CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Regulations  
 CWA = Clean Water Act  
 DOI = Department of the Interior  
 FWS = Fish and Wildlife Service  
 MEPA = Massachusetts Environmental Policy Act  
 MGL = Massachusetts General Laws  
 NMFS = National Marine Fisheries Service  
 USC = United States Code



**TABLE 8-15**  
**SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 5**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                                                                                   | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Surface water   | Clean Water Act, Ambient Water Quality Criteria [40 CFR 131; Quality Criteria for Water 1986]                                 | Applicable<br>AOC 11<br>AOC 40 | Federal Ambient Water Quality Criteria (AWQC) include (1) health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and (2) acute and chronic toxicity values for the protection of aquatic life. AWQC for the protection of human health provide protective concentrations for exposure from ingesting contaminated water and contaminated aquatic organisms, and from ingesting contaminated aquatic organisms alone. Remedial actions involving contaminants to surface water or discharge of contaminants to surface water must consider the uses of the water and the circumstances of the release or threatened release. | Remedial actions will be performed in a manner to prevent AWQC exceedances in surface water. Activates at AOC 11 will be performed to prevent AWQC exceedances in the Nashua River. Removal of sediment at AOC 40 will be performed in a manner to prevent AWQC exceedances in Cold Spring Brook Pond. Supernatant from dredged spoil will be monitored to prevent AWQC exceedances in Cold Spring Brook Pond. |
|                      | Groundwater     | Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.53] | Applicable<br>AOC 40           | The National Primary Drinking Water Act establishes Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health based goals set equal to or lower than MCLs.                                               | At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average conditions, and the MCL for arsenic will be met under average and maximum conditions. MCLs are not exceeded at Patton Well.                                                                                                                                                                                                         |

TABLE 8-15  
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 5

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                  | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------|-----------------|--------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Surface water   | Massachusetts Surface Water Quality Standards [314 CMR 4.00] | Applicable<br>AOC 11<br>AOC 40 | Massachusetts Surface Water Quality Standards designate the most sensitive uses for which surface waters of the Commonwealth are to be enhanced, maintained, and protected, and designate minimum water quality criteria for sustaining the designated uses. Surface waters at Fort Devens are classified as Class B. Surface waters assigned to this class are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. These criteria supersede federal AWQC only when they are more stringent (more protective) than the AWQC. | At AOC 11 activities will be performed in a manner to prevent exceedances of surface water quality in the Nashua River.<br><br>At AOC 40 sediment removal will be performed in a manner to prevent exceedances of Surface Water Quality Standards in Cold Spring Brook Pond. Supernatant from dredged spoil dewatering will be monitored to prevent exceedances in the pond. To the extent necessary, Surface Water Quality Standards will be used to develop discharge limitations. |

Notes:

= Ambient Water Quality Criteria  
 = CERCLA  
 = Comprehensive Environmental Response, Compensation, and Liability Act  
 = CFR  
 = Code of Federal Regulations  
 = Code of Massachusetts Rules  
 = CWA  
 = Clean Water Act  
 = MCL  
 = Maximum Contaminant Level  
 = MCLG  
 = Maximum Contaminant Level Goal  
 = MMCL  
 = Massachusetts Maximum Contaminant Level  
 = NPDWR  
 = National Primary Drinking Water Regulations  
 = SDWA  
 = Safe Drinking Water Act  
 = SMCL  
 = Secondary Maximum Contaminant Level



**TABLE 8-16**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 5**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION                                                                                           | REQUIREMENT                                                                                         | STATUS                                                                                        | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                     |
|----------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Control of surface water runoff.<br>Direct discharge to surface water.                           | Clean Water Act Program [40 CFR 122.125]                                                            | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41<br>Consolidation Facility | The National Pollutant Discharge Elimination System (NPDES) permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to waters of the United States.                                                                                                                                                                                                                                                                                                                              | Construction activities will be controlled to meet USEPA discharge requirements. On-site discharges will meet the substantive requirements of these regulations.             |
|                      | Land Disposal of Hazardous Wastes.                                                               | Resource Conservation and Recovery Act (RCRA), Land Disposal Restrictions (LDRs); (40 CFR Part 268) | Applicable<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41                   | Land disposal of RCRA hazardous wastes without specified treatment is restricted. Remedial actions must be evaluated to determine if they constitute "placement" and if LDRs are applicable. The LDRs require that wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility.                                                                                                                                                                                                       | If it is determined that excavated materials are hazardous materials subject to LDRs, the materials will be handled and disposed of in compliance with these regulations.    |
| State                | Activities carried out with Commonwealth financial assistance or requiring Commonwealth permits. | Massachusetts Environmental Policy Act and regulations [MGL c.30; 301 CMR 11.00]                    | Relevant and Appropriate Consolidation Facility                                               | A project is subject to the Massachusetts Environmental Policy Act if it requires state agency action, financial assistance, or permit. For such projects, an Environmental Notification form must be filed if a project exceeds the following: (1) a categorical inclusion threshold set forth in 301 CMR 11.25; (2) a review threshold set forth in 301 CMR 11.26 for agency permits; (3) a review threshold for agency action or financial assistance set forth in 301 CMR 11.25; (4) the area is designated an area of critical environmental concern (301 CMR 12.00). | The documents developed during the remedial investigation, feasibility study, Record of Decision, conceptual design, and final design will meet the requirements of the EIR. |

TABLE 8-16  
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 5

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | ACTION                                                                        | REQUIREMENT                                                                             | STATUS                                                                          | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                            | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Solid Waste Landfill Siting.                                                  | Massachusetts Solid Waste Facilities Site Regulations [310 CMR 16.00]                   | Applicable Consolidation Facility                                               | These regulations outline the requirements for selecting the site of a new solid waste landfill in the Commonwealth of Massachusetts.                                                                                                                                                                                                                           | The consolidation facility will be sited in accordance with these regulations.                                                                                                                                                                                                                                                                                                                                                                               |
| State                | Solid Waste Landfill Construction, Operation, Closure, and Post-Closure Care. | Massachusetts Solid Waste Management Regulations [310 CMR 19.100]                       | Applicable AOC 9 AOC 11 Relevant and Appropriate SA 6 SA 12 SA 13 AOC 40 AOC 41 | These regulations outline the requirements for construction, operation, closure, and post closure at solid waste management facilities in the Commonwealth of Massachusetts.                                                                                                                                                                                    | Final closure and post-closure plans will be prepared and submitted to satisfy the requirements of 310 CMR 19.021 for all disposal areas; however, only debris removal is proposed for AOC 11.<br><br>The proposed landfill cover systems at SA 6, SA 12, SA 13, and AOC 41 will meet the requirements of 310 CMR 19.112.<br><br>The consolidation landfill will be constructed, operated, and closed in conformance with the regulations at 319 CMR 19.000. |
| State                | Activities that potentially affect surface water quality.                     | Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00] | Relevant and Appropriate AOC 40                                                 | For activities that require a MADEP Wetlands Order of Conditions to dredge or fill navigable waters or wetlands, a Chapter 91 Waterways License, a USACE permit or any major permit issued by USEPA (e.g., Clean Water Act NPDES permit), a Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00. | A Record Notice of Landfill Operation will be filed for SA 6, AOC 11, SA 12, SA 13, and AOC 41 in accordance with 310 CMR 19.141.<br><br>Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to attain and maintain Massachusetts Water Quality Standards in affected waters.                                                                           |



TABLE 8-16  
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 5

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | ACTION | REQUIREMENT                                                    | STATUS                                                | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                       |
|----------------------|--------|----------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                |        | Massachusetts Air Pollution Control Regulations [310 CMR 7.00] | Applicable AOC 9 AOC 11 AOC 40 Consolidation Facility | These regulations pertain to the prevention of emissions in excess of Massachusetts or national ambient air quality standards or in excess of emission limitations in those regulations. Specifically, Section 6.04 governs ambient air quality such as particulate matter standards. Emissions from site treatment activities must be maintained at an annual geometric mean of 75 g/m <sup>3</sup> and a maximum 24-hour concentration of 40 mg/m <sup>3</sup> (primary standard). Carbon monoxide, nitrogen dioxide, and lead are also regulated. Section 7.02 governs plan approval and emissions limitations. A permit and BACT are required prior to operation. Under Section 7.02, visible emissions are limited. Additionally, the Massachusetts toxic air pollutant (TAP) control program requirements will be considered. | Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18). |

Notes:

CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Rules  
 CWA = Clean Water Act  
 MADEP = Massachusetts Department of Environmental Protection  
 MGL = Massachusetts General Laws  
 NPDES = National Pollutant Discharge Elimination System  
 USACE = U.S. Army Corps of Engineers  
 USC = United States Code

**TABLE 8 - 17**  
**COST SUMMARY TABLE**  
**ALTERNATIVE 5: LIMITED REMOVAL AT AOC 11;**  
**CAP-IN-PLACE SAs 6, 12, 13, AOC 41;**  
**EXCAVATE AND CONSOLIDATE AOCs 9 & 40**

**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| ITEM                                                   | TOTAL COST    |
|--------------------------------------------------------|---------------|
| <b>DIRECT COSTS</b>                                    |               |
| LIMITED REMOVAL AT AOC 11                              | \$ 44,000     |
| CAP IN PLACE                                           |               |
| SA 6                                                   | 159,000       |
| SA 12                                                  | 507,000       |
| SA 13                                                  | 395,000       |
| AOC 41                                                 | 175,000       |
| EXCAVATE AND CONSOLIDATE                               |               |
| AOC 9                                                  | 3,835,000     |
| AOC 40                                                 | 3,370,000     |
| CONSOLIDATION LANDFILL CONSTRUCTION                    | 5,240,000     |
| <b>TOTAL DIRECT COSTS</b>                              | \$ 13,725,000 |
| <b>INDIRECT COSTS</b>                                  |               |
| HEALTH AND SAFETY                                      | \$ 686,000    |
| LEGAL, ADMIN, PERMITTING                               | 686,000       |
| ENGINEERING                                            | 1,373,000     |
| SERVICES DURING CONSTRUCTION                           | 1,373,000     |
| <b>TOTAL INDIRECT COSTS</b>                            | \$ 4,118,000  |
| <b>TOTAL CAPITAL (DIRECT + INDIRECT) COSTS</b>         | \$ 17,843,000 |
| <b>OPERATION AND MAINTENANCE COSTS</b>                 |               |
| TOTAL ANNUAL O&M COSTS FOR AOC 11 - 2 YRS              | \$ 4,000      |
| TOTAL ANNUAL O&M COSTS FOR CAP IN PLACE AREAS - 30 YRS | 109,000       |
| TOTAL ANNUAL O&M COSTS CONSOLIDATION LANDFILL - 30 YRS | 23,000        |
| TOTAL ADDITIONAL ANNUAL O&M COSTS FOR AOC 40 - 5 YRS   | 29,000        |
| <b>TOTAL PRESENT WORTH OF O&amp;M COSTS</b>            | \$ 1,764,000  |
| <b>TOTAL COSTS ALTERNATIVE 5</b>                       | \$ 19,607,000 |



**TABLE 8-18**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 6**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                | REQUIREMENT                                                                                 | STATUS                                                              | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                      |
|----------------------|----------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Floodplains                            | Floodplain Management Executive Order No. 11988 [40 CFR Part 6, App. A]                     | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.                                                                                                                                                                                                                                       | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |
|                      | Wetlands                               | Protection of Wetlands Executive Order No. 11990 [40 CFR Part 6, App. A]                    | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.                                                                                                                                                                                                                                                                                                                                               | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |
| Federal              | Wetlands Aquatic Ecosystem             | Clean Water Act, Dredge or Fill Requirements Section 404 [33 CFR Part 230; 40 CFR Part 230] | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | Section 404 of the Clean Water Act regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a discharge of fill materials. Procedures for complying with regulatory conditions are contained in 33 CFR Part 323. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under Clean Water Act Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands. | The removal of drums/sediments and cover installation will be designed to minimize placement of fill in wetland areas. If this alternative is chosen, the affected areas will be restored to the extent necessary.                                            |
| Federal              | Construction over/in navigable waters. | Rivers and Harbors Act of 1899 [33 USC 401 et seq.]                                         | Applicable<br>AOC 40                                                | Section 10 of the Rivers and Harbors Act of 1899 requires an authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers (USACE), for the construction of any structure in or over any "navigable water of the U.S."; the excavation from or deposition of material in such waters, or any obstruction of alteration in such waters.                                                                                                                                                                                                                                                                                                                                             | Excavating, filling, and disposal activities will be conducted to meet the substantive criteria and standards of these regulations.                                                                                                                           |

**TABLE 8-18**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 6**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                                   | REQUIREMENT                                                              | STATUS                                                                                                              | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                     |
|----------------------|-----------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Surface Waters<br>Endangered Species<br>Migratory Species | Fish and Wildlife Coordination Act [16 USC 661 et seq.; 40 CFR Part 302] | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41                                                 | Actions that affect species/habitat require consultation with U.S. Department of Interior, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions.<br>Under 40 CFR Part 300.38, these requirements apply to all response activities under the National Contingency Plan. | To the extent necessary, actions will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The U.S. Fish and Wildlife Service, acting as a review agency for the USEPA, will be kept informed of proposed remedial actions. |
|                      | Endangered Species                                        | Endangered Species Act [16 USC 1531 et seq.; 50 CFR Part 402]            | Relevant and Appropriate<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41<br>Consolidation Facility | This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | The protection of endangered species and their habitat will be considered during excavation activities and cover installation.                                                                                                                                                               |
| Federal              | Atlantic Flyway<br>Wetlands<br>Surface Waters             | Migratory Bird Treaty Act (16 USC 703-711)                               | Applicable<br>AOC 11                                                                                                | The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Remedial actions will be performed to protect migratory birds, their nests, and eggs.                                                                                                                                                                                                        |
| Federal              | Archeological Sites                                       | Archeological Resources Protection Act of 1979 [16 USC 47099-11]         | Relevant and Appropriate<br>SA 6                                                                                    | This law prohibits the excavation, damage, alteration, and trade of archeological resources obtained illegally from public or Native American.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Remedial actions will be performed to prevent the illegal excavation, damage, alteration, or trade of archeological resources.                                                                                                                                                               |



**TABLE 8-18**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 6**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                   | REQUIREMENT                                                                                                                                               | STATUS                                                                                                | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                             |
|----------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Archeological and Historic Sites          | Archeological and Historic Data Preservation Act [16 USC 469-469c; 40 CFR 469; 40 CFR 6.301(c)] and National Historic Preservation Act [16 USC 470-470w6] | Applicable<br>SA 6                                                                                    | These laws establish the procedures for the inventory, registration, and preservation of historical and archeological resources. Such resources must be retrieved, preserved, and properly managed when terrain is altered as a result of a federal or federally licensed construction activity.                                                                                                                                                                                                                                                                                                                                                        | Remedial actions will be conducted to inventory, register, and preserve historical and archeological resources.                                                                                      |
| State                | Floodplains<br>Wetlands<br>Surface Waters | Massachusetts Wetland Protection Act and regulations [MGL c. 131 s. 40; 310 CMR 10.00]                                                                    | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41                                   | These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year floodplain). A Notice of Intent (NOI) must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons. | All work to be performed within wetlands and the 100 foot buffer zone will be in accordance with the substantive requirements of these regulations.                                                  |
| State                | Construction over/in a waterway.          | Massachusetts Waterways Act [MGL c. 91; 310 CMR 9.00]                                                                                                     | Relevant and Appropriate<br>AOC 40                                                                    | The Massachusetts Waterways Act and regulations require that a license from Massachusetts Department of Environmental Protection (MADEP) be obtained for any work in or over any tidelands, river or stream (with respect to which public funds have been expended), or great pond, or outlet thereof.                                                                                                                                                                                                                                                                                                                                                  | Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations                                                                                   |
| State                | Endangered Species                        | Massachusetts Endangered Species Act and implementing regulations [MGL c. 131A, s. 1 et seq.; 321 CMR 8.00]                                               | Applicable<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41<br>Consolidation Facility | Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.                                                                                                                                                                                                                                                                                                                                                                                                                                                      | The protection of state listed endangered species (in particular the Grasshopper Sparrow at the Consolidation Facility) will be considered during the design and implementation of this alternative. |

**TABLE 8-18**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 6**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC | REQUIREMENT                          | STATUS            | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                       |
|----------------------|-------------------------|--------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| State                | Nashua River            | Scenic Rivers Act [MGL c. 21 s. 27B] | Applicable AOC 11 | As part of the Massachusetts Department of Environmental Management's Scenic Rivers Program, the Nashua River and contiguous land up to 100 yards on each side of its natural banks are afforded special protection under this law. | Remedial activities will be performed to comply with the substantive requirements of this act. |

**Notes:**

CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Regulations  
 CWA = Clean Water Act  
 DOI = Department of the Interior  
 FWS = Fish and Wildlife Service  
 MEPA = Massachusetts Environmental Policy Act  
 MGL = Massachusetts General Laws  
 NMFS = National Marine Fisheries Service  
 USC = United States Code



**TABLE 8-19**  
**SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 6**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                                                                                   | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Surface water   | Clean Water Act, Ambient Water Quality Criteria [40 CFR 131; Quality Criteria for Water 1986]                                 | Applicable<br>AOC 11<br>AOC 40 | Federal Ambient Water Quality Criteria (AWQC) include (1) health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and (2) acute and chronic toxicity values for the protection of aquatic life. AWQC for the protection of human health provide protective concentrations for exposure from ingesting contaminated water and contaminated aquatic organisms, and from ingesting contaminated aquatic organisms alone. Remedial actions involving contaminated surface water or discharge of contaminants to surface water must consider the uses of the water and the circumstances of the release or threatened release. | Remedial actions will be performed in a manner to prevent AWQC exceedances in surface water. Activates at AOC 11 will be performed to prevent AWQC exceedances in the Nashua River. Removal of sediment at AOC 40 will be performed in a manner to prevent AWQC exceedances in Cold Spring Brook Pond. Supernatant from dredged spoil will be monitored to prevent AWQC exceedances in Cold Spring Brook Pond. |
|                      | Groundwater     | Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.53] | Applicable<br>AOC 40           | The National Primary Drinking Water Act establishes Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health based goals set equal to or lower than MCLs.                                            | At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average conditions, and the MCL for arsenic will be met under average and maximum conditions. MCLs are not exceeded at Patton Well.                                                                                                                                                                                                         |

TABLE 8-19  
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 6

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                  | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------|-----------------|--------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Surface water   | Massachusetts Surface Water Quality Standards [314 CMR 4.00] | Applicable<br>AOC 11<br>AOC 40 | Massachusetts Surface Water Quality Standards designate the most sensitive uses for which surface waters of the Commonwealth are to be enhanced, maintained, and protected, and designate minimum water quality criteria for waters at Fort Devens are classified as Class B. Surface waters assigned to this class are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. These criteria supersede federal AWQC only when they are more stringent (more protective) than the AWQC. | At AOC 11 activities will be performed in a manner to prevent exceedances of surface water quality in the Nashua River.<br><br>At AOC 40 sediment removal will be performed in a manner to prevent exceedances of Surface Water Quality Standards in Cold Spring Brook Pond. Supernatant from dredged spoil dewatering will be monitored to prevent exceedances in the pond. To the extent necessary, Surface Water Quality Standards will be used to develop discharge limitations. |

Notes:

= Ambient Water Quality Criteria  
 = Comprehensive Environmental Response, Compensation, and Liability Act  
 CERCLA =  
 = Code of Federal Regulations  
 CFR =  
 = Code of Massachusetts Rules  
 CMR =  
 = Clean Water Act  
 CWA =  
 = Maximum Contaminant Level  
 MCL =  
 = Maximum Contaminant Level Goal  
 MCLG =  
 = Massachusetts Maximum Contaminant Level  
 MMCL =  
 = National Primary Drinking Water Regulations  
 NPDWR =  
 = Safe Drinking Water Act  
 SDWA =  
 = Secondary Maximum Contaminant Level  
 SMCL =



**TABLE 8-20**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 6**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION                                                                        | REQUIREMENT                                                                                         | STATUS                                                                                                  | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                 | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                |
|----------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Control of surface water runoff.<br>Direct discharge to surface water.        | Clean Water Act Program [40 CFR 122.125]                                                            | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41<br>Consolidation Facility           | The National Pollutant Discharge Elimination System (NPDES) permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to waters of the United States.                                                                                                                        | Construction activities will be controlled to meet USEPA discharge requirements. On-site discharges will meet the substantive requirements of these regulations.                                                                                                                                                                                                                        |
|                      | Land Disposal of Hazardous Wastes.                                            | Resource Conservation and Recovery Act (RCRA), Land Disposal Restrictions (LDRs); (40 CFR Part 268) | Applicable<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41                             | Land disposal of RCRA hazardous wastes without specified treatment is restricted. Remedial actions must be evaluated to determine if they constitute "placement" and if LDRs are applicable. The LDRs require that wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility. | If it is determined that excavated materials are hazardous materials subject to LDRs, the materials will be handled and disposed of in compliance with these regulations.                                                                                                                                                                                                               |
| State                | Solid Waste Landfill Siting.                                                  | Massachusetts Solid Waste Facilities Site Regulations [310 CMR 16.00]                               | Applicable<br>Consolidation Facility                                                                    | These regulations outline the requirements for selecting the site of a new solid waste landfill in the Commonwealth of Massachusetts.                                                                                                                                                                                                                                | The consolidation facility will be sited in accordance with these regulations.                                                                                                                                                                                                                                                                                                          |
| State                | Solid Waste Landfill Construction, Operation, Closure, and Post-Closure Care. | Massachusetts Solid Waste Management Regulations [310 CMR 19.100]                                   | Applicable<br>AOC 9<br>AOC 11<br>Relevant and Appropriate<br>SA 6<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | These regulations outline the requirements for construction, operation, closure, and post closure at solid waste management facilities in the Commonwealth of Massachusetts.                                                                                                                                                                                         | Final closure and post-closure plans will be prepared and submitted to satisfy the requirements of 310 CMR 19.021 for all disposal areas.                                                                                                                                                                                                                                               |
|                      |                                                                               |                                                                                                     |                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                      | The proposed landfill cover systems at SA 6, SA 12, SA 13, and AOC 41 will meet the requirements of 310 CMR 19.112.<br><br>The consolidation landfill will be constructed, operated, and closed in conformance with the regulations at 319 CMR 19.000.<br><br>A Record Notice of Landfill Operation will be filed for SA 6, SA 12, SA 13, and AOC 41 in accordance with 310 CMR 19.141. |

TABLE 8-20  
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 6

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | ACTION                                                    | REQUIREMENT                                                                             | STATUS                                                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                  |
|----------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Activities that potentially affect surface water quality. | Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00] | Relevant and Appropriate AOC 40                                | For activities that require a MADEP Wetlands Order of Conditions to dredge or fill navigable waters or wetlands, a Chapter 91 Waterways License, a USACE permit or any major permit issued by USEPA (e.g., Clean Water Act NPDES permit), a Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to attain and maintain Massachusetts Water Quality Standards in affected waters. |
| State                |                                                           | Massachusetts Air Pollution Control Regulations [310 CMR 7.00]                          | Applicable AOC 9<br>AOC 11<br>AOC 40<br>Consolidation Facility | These regulations pertain to the prevention of emissions in excess of Massachusetts or national ambient air quality standards or in excess of emission limitations in those regulations. Specifically, Section 6.04 governs ambient air quality such as particulate matter standards. Emissions from site treatment activities must be maintained at an annual geometric mean of 75 g/m <sup>3</sup> and a maximum 24-hour concentration of 40 mg/m <sup>3</sup> (primary standard). Carbon monoxide, nitrogen dioxide, and lead are also regulated. Section 7.02 governs plan approval and emissions limitations. A permit and BACT are required prior to operation. Under Section 7.02, visible emissions are limited. Additionally, the Massachusetts toxic air pollutant (TAP) control program requirements will be considered. | Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18).            |

Notes:

- Code of Federal Regulations
- Code of Massachusetts Rules
- Clean Water Act
- MADEP
- Massachusetts Department of Environmental Protection
- MGL
- Massachusetts General Laws
- NPDES
- National Pollutant Discharge Elimination System
- USACE
- U.S. Army Corps of Engineers
- USC
- United States Code



**TABLE 8 - 21**  
**COST SUMMARY TABLE**  
**ALTERNATIVE 6: CAP-IN-PLACE SAs 6, 12, 13, AOC 41;**  
**EXCAVATE AND CONSOLIDATE AOCs 9, 11, & 40**

**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| ITEM                                                   | TOTAL COST    |
|--------------------------------------------------------|---------------|
| <b>DIRECT COSTS</b>                                    |               |
| CAP IN PLACE                                           |               |
| SA 6                                                   | \$ 159,000    |
| SA 12                                                  | 507,000       |
| SA 13                                                  | 395,000       |
| AOC 41                                                 | 175,000       |
| EXCAVATE AND CONSOLIDATE                               |               |
| AOC 9                                                  | 3,835,000     |
| AOC 11                                                 | 1,571,000     |
| AOC 40                                                 | 3,370,000     |
| CONSOLIDATION LANDFILL CONSTRUCTION                    | 5,240,000     |
| <b>TOTAL DIRECT COSTS</b>                              | \$ 15,252,000 |
| <b>INDIRECT COSTS</b>                                  |               |
| HEALTH AND SAFETY                                      | \$ 763,000    |
| LEGAL, ADMIN, PERMITTING                               | 763,000       |
| ENGINEERING                                            | 1,525,000     |
| SERVICES DURING CONSTRUCTION                           | 1,525,000     |
| <b>TOTAL INDIRECT COSTS</b>                            | \$ 4,576,000  |
| <b>TOTAL CAPITAL (DIRECT + INDIRECT) COSTS</b>         | \$ 19,828,000 |
| <b>OPERATION AND MAINTENANCE COSTS</b>                 |               |
| TOTAL ANNUAL O&M COSTS FOR CAP IN PLACE AREAS - 30 YRS | \$ 109,000    |
| TOTAL ANNUAL O&M COSTS CONSOLIDATION LANDFILL - 30 YRS | 23,000        |
| TOTAL ADDITIONAL ANNUAL O&M COSTS FOR AOC 40 - 5 YRS   | 29,000        |
| <b>TOTAL PRESENT WORTH OF O&amp;M COSTS</b>            | \$ 1,757,000  |
| <b>TOTAL COSTS ALTERNATIVE 6</b>                       | \$ 21,585,000 |

**TABLE 8-22**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 7**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                | REQUIREMENT                                                                                 | STATUS                                                              | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                      |
|----------------------|----------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Floodplains                            | Floodplain Management Executive Order No. 11988 [40 CFR Part 6, App. A]                     | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.                                                                                                                                                                                                                                       | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |
|                      | Wetlands                               | Protection of Wetlands Executive Order No. 11990 [40 CFR Part 6, App. A]                    | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.                                                                                                                                                                                                                                                                                                                                               | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |
| Federal              | Wetlands Aquatic Ecosystem             | Clean Water Act, Dredge or Fill Requirements Section 404 [33 CFR Part 230; 40 CFR Part 230] | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | Section 404 of the Clean Water Act regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a discharge of fill materials. Procedures for complying with regulatory conditions are contained in 33 CFR Part 323. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under Clean Water Act Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands. | The removal of drums/sediments and cover installation will be designed to minimize placement of fill in wetland areas. If this alternative is chosen, the affected areas will be restored to the extent necessary.                                            |
| Federal              | Construction over/in navigable waters. | Rivers and Harbors Act of 1899 [33 USC 401 et seq.]                                         | Applicable<br>AOC 40                                                | Section 10 of the Rivers and Harbors Act of 1899 requires an authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers (USACE), for the construction of any structure in or over any "navigable water of the U.S."; the excavation from or deposition of material in such waters, or any obstruction of alteration in such waters.                                                                                                                                                                                                                                                                                                                                             | Excavating, filling, and disposal activities will be conducted to meet the substantive criteria and standards of these regulations.                                                                                                                           |



**TABLE 8-22**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 7**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| <b>REGULATORY AUTHORITY</b> | <b>LOCATION CHARACTERISTIC</b>                            | <b>REQUIREMENT</b>                                                       | <b>STATUS</b>                                                                             | <b>REQUIREMENT SYNOPSIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>ACTION TO BE TAKEN TO ATTAIN REQUIREMENT</b>                                                                                                                                                                                                                                              |
|-----------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal                     | Surface Waters<br>Endangered Species<br>Migratory Species | Fish and Wildlife Coordination Act [16 USC 661 et seq.; 40 CFR Part 302] | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41                       | Actions that affect species/habitat require consultation with U.S. Department of Interior, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions.<br>Under 40 CFR Part 300.38, these requirements apply to all response activities under the National Contingency Plan. | To the extent necessary, actions will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The U.S. Fish and Wildlife Service, acting as a review agency for the USEPA, will be kept informed of proposed remedial actions. |
|                             | Endangered Species                                        | Endangered Species Act [16 USC 1531 et seq.; 50 CFR Part 402]            | Relevant and Appropriate<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | The protection of endangered species and their habitat will be considered during excavation activities and cover installation.                                                                                                                                                               |
| Federal                     | Atlantic Flyway<br>Wetlands<br>Surface Waters             | Migratory Bird Treaty Act (16 USC 703-711)                               | Applicable<br>AOC 11                                                                      | The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Remedial actions will be performed to protect migratory birds, their nests, and eggs.                                                                                                                                                                                                        |
| Federal                     | Archeological Sites                                       | Archeological Resources Protection Act of 1979 [16 USC 47099-11]         | Relevant and Appropriate<br>SA 6                                                          | This law prohibits the excavation, damage, alteration, and trade of archeological resources obtained illegally from public or Native American.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Remedial actions will be performed to prevent the illegal excavation, damage, alteration, or trade of archeological resources.                                                                                                                                                               |

TABLE 8-22  
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 7

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                   | REQUIREMENT                                                                                                                                               | STATUS                                                                      | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                            |
|----------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Archeological and Historic Sites          | Archeological and Historic Data Preservation Act [16 USC 469-469c; 40 CFR 469; 40 CFR 6.301(c)] and National Historic Preservation Act [16 USC 470-470w6] | Applicable<br>SA 6                                                          | These laws establish the procedures for the inventory, registration, and preservation of historical and archeological resources. Such resources must be retrieved, preserved, and properly managed when terrain is altered as a result of a federal or federally licensed construction activity.                                                                                                                                                                                                                                                                                                                                                        | Remedial actions will be conducted to inventory, register, and preserve historical and archeological resources.                                     |
| State                | Floodplains<br>Wetlands<br>Surface Waters | Massachusetts Wetland Protection Act and regulations [MGL c. 131 s. 40; 310 CMR 10.00]                                                                    | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41         | These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year floodplain). A Notice of Intent (NOI) must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons. | All work to be performed within wetlands and the 100 foot buffer zone will be in accordance with the substantive requirements of these regulations. |
| State                | Construction over/in a waterway.          | Massachusetts Waterways Act [MGL c. 91; 310 CMR 9.00]                                                                                                     | Relevant and Appropriate<br>AOC 40                                          | The Massachusetts Waterways Act and regulations require that a license from Massachusetts Department of Environmental Protection (MADEP) be obtained for any work in or over any tidelands, river or stream (with respect to which public funds have been expended), or great pond, or outlet thereof.                                                                                                                                                                                                                                                                                                                                                  | Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations                                  |
| State                | Endangered Species                        | Massachusetts Endangered Species Act and implementing regulations [MGL c. 131A, s. 1 et seq.; 321 CMR 8.00]                                               | Applicable<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.                                                                                                                                                                                                                                                                                                                                                                                                                                                      | The protection of state listed endangered species will be considered during the design and implementation of this alternative.                      |



**TABLE 8-22**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 7**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC | REQUIREMENT                          | STATUS            | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                       |
|----------------------|-------------------------|--------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| State                | Nashua River            | Scenic Rivers Act [MGL c. 21 s. 27B] | Applicable AOC 11 | As part of the Massachusetts Department of Environmental Management's Scenic Rivers Program, the Nashua River and contiguous land up to 100 yards on each side of its natural banks are afforded special protection under this law. | Remedial activities will be performed to comply with the substantive requirements of this act. |

**Notes:**

= Code of Federal Regulations  
 CFR Code of Massachusetts Regulations  
 = Clean Water Act  
 CWA Department of the Interior  
 = Fish and Wildlife Service  
 DOI Massachusetts Environmental Policy Act  
 = Massachusetts General Laws  
 MEPA National Marine Fisheries Service  
 MGL United States Code  
 =  
 NMFS  
 =  
 USC

**TABLE 8-23**  
**SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 7**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                                                                                   | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Surface water   | Clean Water Act, Ambient Water Quality Criteria [40 CFR 131; Quality Criteria for Water 1986]                                 | Applicable<br>AOC 11<br>AOC 40 | Federal Ambient Water Quality Criteria (AWQC) include (1) health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and (2) acute and chronic toxicity values for the protection of aquatic life. AWQC for the protection of human health provide protective concentrations for exposure from ingesting contaminated water and contaminated aquatic organisms, and from ingesting contaminated aquatic organisms alone. Remedial actions involving contaminated surface water or discharge of contaminants to surface water must consider the uses of the water and the circumstances of the release or threatened release. | Remedial actions will be performed in a manner to prevent AWQC exceedances in surface water. Activates at AOC 11 will be performed to prevent AWQC exceedances in the Nashua River. Removal of sediment at AOC 40 will be performed in a manner to prevent AWQC exceedances in Cold Spring Brook Pond. Supernatant from dredged spoil will be monitored to prevent AWQC exceedances in Cold Spring Brook Pond. |
|                      | Groundwater     | Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.53] | Applicable<br>AOC 40           | The National Primary Drinking Water Act establishes Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health based goals set equal to or lower than MCLs.                                            | At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average conditions, and the MCL for arsenic will be met under average and maximum conditions. MCLs are not exceeded at Patton Well.                                                                                                                                                                                                         |



**TABLE 8-23**  
**SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 7**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                  | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------|-----------------|--------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Surface water   | Massachusetts Surface Water Quality Standards [314 CMR 4.00] | Applicable<br>AOC 11<br>AOC 40 | Massachusetts Surface Water Quality Standards designate the most sensitive uses for which surface waters of the Commonwealth are to be enhanced, maintained, and protected, and designate minimum water quality criteria for sustaining the designated uses. Surface waters at Fort Devens are classified as Class B. Surface waters assigned to this class are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. These criteria supersede federal AWQC only when they are more stringent (more protective) than the AWQC. | At AOC 11 activities will be performed in a manner to prevent exceedances of surface water quality in the Nashua River.<br><br>At AOC 40 sediment removal will be performed in a manner to prevent exceedances of Surface Water Quality Standards in Cold Spring Brook Pond. Supernatant from dredged spoil dewatering will be monitored to prevent exceedances in the pond. To the extent necessary, Surface Water Quality will be used to develop discharge limitations. |

**Notes:**

AWQC = Ambient Water Quality Criteria  
 CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act  
 CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Rules  
 CWA = Clean Water Act  
 MCL = Maximum Contaminant Level  
 MCLG = Maximum Contaminant Level Goal  
 MMCL = Massachusetts Maximum Contaminant Level  
 NPDWR = National Primary Drinking Water Regulations  
 SDWA = Safe Drinking Water Act  
 SMCL = Secondary Maximum Contaminant Level

**TABLE 8-24**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 7**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION                                                                        | REQUIREMENT                                                                                         | STATUS                                                                                                  | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                 | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Control of surface water runoff. Direct discharge to surface water.           | Clean Water Act Program (40 CFR 122.125)                                                            | Applicable<br>AOC 9<br>AOC 11<br>AOC 40                                                                 | The National Pollutant Discharge Elimination System (NPDES) permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to waters of the United States.                                                                                                                        | Construction activities will be controlled to meet USEPA discharge requirements. On-site discharges will meet the substantive requirements of these regulations.                                                                                                                                                                                                                                                                                                             |
|                      | Land Disposal of Hazardous Wastes.                                            | Resource Conservation and Recovery Act (RCRA), Land Disposal Restrictions (LDRs); (40 CFR Part 268) | Applicable<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41                             | Land disposal of RCRA hazardous wastes without specified treatment is restricted. Remedial actions must be evaluated to determine if they constitute "placement" and if LDRs are applicable. The LDRs require that wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility. | If it is determined that excavated materials are hazardous materials subject to LDRs, the materials will be handled and disposed of in compliance with these regulations.                                                                                                                                                                                                                                                                                                    |
| State                | Solid Waste Landfill Construction, Operation, Closure, and Post-Closure Care. | Massachusetts Solid Waste Management Regulations [310 CMR 19.100]                                   | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>Relevant and Appropriate<br>SA 6<br>SA 13<br>AOC 40<br>AOC 41 | These regulations outline the requirements for construction, operation, closure, and post closure at solid waste management facilities in the Commonwealth of Massachusetts.                                                                                                                                                                                         | Final closure and post-closure plans will be prepared and submitted to satisfy the requirements of 310 CMR 19.021 for all disposal areas.<br><br>The proposed landfill cover systems at SA 6, AOC 9, AOC 11, SA 12, SA 13, and AOC 41 will meet the requirements of 310 CMR 19.112.<br><br>The proposed landfill cover at AOC 40 will conform with the intent of 310 CMR 19.112, although it may be considered an Alternative Cover System Design by MADEP (310 CMR 19.113). |
|                      | Activities that potentially affect surface water quality.                     | Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00]             | Relevant and Appropriate<br>AOC 40                                                                      | For activities that require a MADEP Wetlands Order of Conditions to dredge or fill navigable waters or wetlands, a Chapter 91 Waterways License, a USACE permit or any major permit issued by USEPA (e.g., Clean Water Act NPDES permit), a Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00.      | A Record Notice of Landfill Operation will be filed for all disposal areas in accordance with 310 CMR 19.141.<br><br>Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to attain and maintain Massachusetts Water Quality Standards in affected waters.                                                                                                               |



**TABLE 8-24**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 7**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION | REQUIREMENT                                                    | STATUS                                                                      | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                       |
|----------------------|--------|----------------------------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                |        | Massachusetts Air Pollution Control Regulations [310 CMR 7.00] | Applicable<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | These regulations pertain to the prevention of emissions in excess of Massachusetts or national ambient air quality standards or in excess of emission limitations in those regulations. Specifically, Section 6.04 governs ambient air quality such as particulate matter standards. Emissions from site treatment activities must be maintained at an annual geometric mean of 75 g/m <sup>3</sup> and a maximum 24-hour concentration of 40 mg/m <sup>3</sup> (primary standard). Carbon monoxide, nitrogen dioxide, and lead are also regulated. Section 7.02 governs plan approval and emissions limitations. A permit and BACT are required prior to operation. Under Section 7.02, visible emissions are limited. Additionally, the Massachusetts toxic air pollutant (TAP) control program requirements will be considered. | Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18). |

**Notes:**

CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Rules  
 CWA = Clean Water Act  
 MADEP = Massachusetts Department of Environmental Protection  
 MGL = Massachusetts General Laws  
 NPDES = National Pollutant Discharge Elimination System  
 USACE = U.S. Army Corps of Engineers  
 USC = United States Code

**TABLE 8-24**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 7**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION | REQUIREMENT                                                    | STATUS                                                                      | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                       |
|----------------------|--------|----------------------------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                |        | Massachusetts Air Pollution Control Regulations [310 CMR 7.00] | Applicable<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | These regulations pertain to the prevention of emissions in excess of Massachusetts or national ambient air quality standards or in excess of emission limitations in those regulations. Specifically, Section 6.04 governs ambient air quality such as particulate matter standards. Emissions from site treatment activities must be maintained at an annual geometric mean of 75 g/m <sup>3</sup> and a maximum 24-hour concentration of 40 mg/m <sup>3</sup> (primary standard). Carbon monoxide, nitrogen dioxide, and lead are also regulated. Section 7.02 governs plan approval and emissions limitations. A permit and BACT are required prior to operation. Under Section 7.02, visible emissions are limited. Additionally, the Massachusetts toxic air pollutant (TAP) control program requirements will be considered. | Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18). |

**Notes:**

CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Rules  
 CWA = Clean Water Act  
 MADEP = Massachusetts Department of Environmental Protection  
 MGL = Massachusetts General Laws  
 NPDES = National Pollutant Discharge Elimination System  
 USACE = U.S. Army Corps of Engineers  
 USC = United States Code



**TABLE 8 - 25  
COST SUMMARY TABLE  
ALTERNATIVE 7: CAP IN PLACE  
ALL SEVEN DISPOSAL AREAS**

**LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA**

| ITEM                                                 |  | TOTAL COST           |
|------------------------------------------------------|--|----------------------|
| <b>DIRECT COSTS</b>                                  |  |                      |
| SA 6                                                 |  | \$ 159,000           |
| AOC 9                                                |  | 3,301,000            |
| AOC 11                                               |  | 1,269,000            |
| SA 12                                                |  | 507,000              |
| SA 13                                                |  | 395,000              |
| AOC 40                                               |  | 1,758,000            |
| AOC 41                                               |  | 175,000              |
| <b>TOTAL DIRECT COSTS</b>                            |  | <b>\$ 7,564,000</b>  |
| <b>INDIRECT COSTS</b>                                |  |                      |
| HEALTH AND SAFETY                                    |  | \$ 378,000           |
| LEGAL, ADMIN, PERMITTING                             |  | 378,000              |
| ENGINEERING                                          |  | 756,000              |
| SERVICES DURING CONSTRUCTION                         |  | 756,000              |
| <b>TOTAL INDIRECT COSTS</b>                          |  | <b>\$ 2,268,000</b>  |
| <b>TOTAL CAPITAL (DIRECT + INDIRECT) COSTS</b>       |  | <b>\$ 9,832,000</b>  |
| <b>OPERATION AND MAINTENANCE COSTS</b>               |  |                      |
| TOTAL ANNUAL O&M COSTS - 30 YRS                      |  | \$ 208,000           |
| TOTAL ADDITIONAL ANNUAL O&M COSTS FOR AOC 40 - 5 YRS |  | 13,000               |
| <b>TOTAL PRESENT WORTH OF O&amp;M COSTS</b>          |  | <b>\$ 2,834,000</b>  |
| <b>TOTAL COSTS ALTERNATIVE 7</b>                     |  | <b>\$ 12,466,000</b> |

**TABLE 8-26**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 8**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC       | REQUIREMENT                                                                                 | STATUS                                                                            | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                      |
|----------------------|-------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Floodplains                   | Floodplain Management Executive Order No. 11988 [40 CFR Part 6, App. A]                     | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41               | Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.                                                                                                                                                                                                                                       | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |
|                      | Wetlands                      | Protection of Wetlands Executive Order No. 11990 [40 CFR Part 6, App. A]                    | Applicable<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41                        | Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.                                                                                                                                                                                                                                                                                                                                               | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |
| Federal              | Wetlands<br>Aquatic Ecosystem | Clean Water Act, Dredge or Fill Requirements Section 404 [33 CFR Part 230; 40 CFR Part 230] | Relevant and Appropriate<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | Section 404 of the Clean Water Act regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a discharge of fill materials. Procedures for complying with regulatory conditions are contained in 33 CFR Part 323. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under Clean Water Act Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands. | The removal of drums/sediments and cover installation will be designed to minimize placement of fill in wetland areas. If this alternative is chosen, the affected areas will be restored to the extent necessary.                                            |



**TABLE 8-26**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 8**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| <b>REGULATORY AUTHORITY</b> | <b>LOCATION CHARACTERISTIC</b>                            | <b>REQUIREMENT</b>                                                       | <b>STATUS</b>                                                                                                       | <b>REQUIREMENT SYNOPSIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>ACTION TO BE TAKEN TO ATTAIN REQUIREMENT</b>                                                                                                                                                                                                                                              |
|-----------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal                     | Construction over/in navigable waters.                    | Rivers and Harbors Act of 1899 [33 USC 401 et seq.]                      | Applicable AOC 40                                                                                                   | Section 10 of the Rivers and Harbors Act of 1899 requires an authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers (USACE), for the construction of any structure in or over any "navigable water of the U.S."; the excavation from or deposition of material in such waters, or any obstruction of alteration in such waters.                                                                                                                                                                                                                                                                                                                                                                                                                  | Excavating, filling, and disposal activities will be conducted to meet the substantive criteria and standards of these regulations.                                                                                                                                                          |
| Federal                     | Surface Waters<br>Endangered Species<br>Migratory Species | Fish and Wildlife Coordination Act [16 USC 661 et seq.; 40 CFR Part 302] | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41                                                 | Actions that affect species/habitat require consultation with U.S. Department of Interior, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions.<br>Under 40 CFR Part 300.38, these requirements apply to all response activities under the National Contingency Plan. | To the extent necessary, actions will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The U.S. Fish and Wildlife Service, acting as a review agency for the USEPA, will be kept informed of proposed remedial actions. |
| Federal                     | Endangered Species                                        | Endangered Species Act [16 USC 1531 et seq.; 50 CFR Part 402]            | Relevant and Appropriate<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41<br>Consolidation Facility | This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | The protection of endangered species and their habitat will be considered during excavation activities and cover installation.                                                                                                                                                               |

**TABLE 8-26**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 8**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                 | REQUIREMENT                                                                                                                                               | STATUS                                                           | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                            |
|----------------------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Atlantic Flyway Wetlands Surface Waters | Migratory Bird Treaty Act (16 USC 703-711)                                                                                                                | Applicable AOC 11                                                | The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Remedial actions will be performed to protect migratory birds, their nests, and eggs.                                                               |
| Federal              | Archeological Sites                     | Archeological Resources Protection Act of 1979 [16 USC 47099-11]                                                                                          | Relevant and Appropriate SA 6                                    | This law prohibits the excavation, damage, alteration, and trade of archeological resources obtained illegally from public or Native American.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Remedial actions will be performed to prevent the illegal excavation, damage, alteration, or trade of archeological resources.                      |
| Federal              | Archeological and Historic Sites        | Archeological and Historic Data Preservation Act [16 USC 469-469c; 40 CFR 469; 40 CFR 6.301(c)] and National Historic Preservation Act [16 USC 470-470w6] | Applicable SA 6                                                  | These laws establish the procedures for the inventory, registration, and preservation of historical and archeological resources. Such resources must be retrieved, preserved, and properly managed when terrain is altered as a result of a federal or federally licensed construction activity.                                                                                                                                                                                                                                                                                                                                                        | Remedial actions will be conducted to inventory, register, and preserve historical and archeological resources.                                     |
| State                | Floodplains Wetlands Surface Waters     | Massachusetts Wetland Protection Act and regulations [MGL c. 131 s. 40; 310 CMR 10.00]                                                                    | Applicable AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year floodplain). A Notice of Intent (NOI) must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons. | All work to be performed within wetlands and the 100 foot buffer zone will be in accordance with the substantive requirements of these regulations. |
| State                | Construction over/in a waterway.        | Massachusetts Waterways Act [MGL c. 91; 310 CMR 9.00]                                                                                                     | Relevant and Appropriate AOC 40                                  | The Massachusetts Waterways Act and regulations require that a license from Massachusetts Department of Environmental Protection (MADEP) be obtained for any work in or over any tidelands, river or stream (with respect to which public funds have been expended), or great pond, or outlet thereof.                                                                                                                                                                                                                                                                                                                                                  | Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations                                  |



**TABLE 8-26**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 8**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC | REQUIREMENT                                                                                                 | STATUS                                                                                                 | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                             |
|----------------------|-------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Endangered Species      | Massachusetts Endangered Species Act and implementing regulations [MGL c. 131A, s. 1 et seq.; 321 CMR 8.00] | Applicable<br>SA 6<br>AOC 9<br>AOC 11<br>AOC 12<br>SA 13<br>AOC 40<br>AOC 41<br>Consolidation Facility | Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.                                  | The protection of state listed endangered species (in particular the Grasshopper Sparrow at the Consolidation Facility) will be considered during the design and implementation of this alternative. |
| State                | Nashua River            | Scenic Rivers Act [MGL c. 21 s. 27B]                                                                        | Applicable<br>AOC 11                                                                                   | As part of the Massachusetts Department of Environmental Management's Scenic Rivers Program, the Nashua River and contiguous land up to 100 yards on each side of its natural banks are afforded special protection under this law. | Remedial activities will be performed to comply with the substantive requirements of this act.                                                                                                       |

**Notes:**

CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Regulations  
 CWA = Clean Water Act  
 DOI = Department of the Interior  
 FWS = Fish and Wildlife Service  
 MEPA = Massachusetts Environmental Policy Act  
 MGL = Massachusetts General Laws  
 NMFS = National Marine Fisheries Service  
 USC = United States Code

**TABLE 8-27**  
**SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 8**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                                                                                   | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Surface water   | Clean Water Act, Ambient Water Quality Criteria [40 CFR 131; Quality Criteria for Water 1986]                                 | Applicable<br>AOC 11<br>AOC 40 | Federal Ambient Water Quality Criteria (AWQC) include (1) health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and (2) acute and chronic toxicity values for the protection of aquatic life. AWQC for the protection of human health provide protective concentrations for exposure from ingesting contaminated water and contaminated aquatic organisms, and from ingesting contaminated aquatic organisms alone. Remedial actions involving contaminated surface water or discharge of contaminants to surface water must consider the uses of the water and the circumstances of the release or threatened release. | Remedial actions will be performed in a manner to prevent AWQC exceedances in surface water. Activates at AOC 11 will be performed to prevent AWQC exceedances in the Nashua River. Removal of sediment at AOC 40 will be performed in a manner to prevent AWQC exceedances in Cold Spring Brook Pond. Supernatant from dredged spoil will be monitored to prevent AWQC exceedances in Cold Spring Brook Pond. |
|                      | Groundwater     | Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.53] | Applicable<br>AOC 40           | The National Primary Drinking Water Act establishes Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health based goals set equal to or lower than MCLs.                                            | At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average conditions, and the MCL for arsenic will be met under average and maximum conditions. MCLs are not exceeded at Patton Well.                                                                                                                                                                                                         |



**TABLE 8-27**  
**SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 8**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                  | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------|-----------------|--------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Surface water   | Massachusetts Surface Water Quality Standards [314 CMR 4.00] | Applicable<br>AOC 11<br>AOC 40 | Massachusetts Surface Water Quality Standards designate the most sensitive uses for which surface waters of the Commonwealth are to be enhanced, maintained, and protected, and designate minimum water quality criteria for sustaining the designated uses. Surface waters at Fort Devens are classified as Class B. Surface waters assigned to this class are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. These criteria supersede federal AWQC only when they are more stringent (more protective) than the AWQC. | At AOC 11 activities will be performed in a manner to prevent exceedances of surface water quality in the Nashua River.<br><br>At AOC 40 sediment removal will be performed in a manner to prevent exceedances of Surface Water Quality Standards in Cold Spring Brook Pond. Supernatant from dredged spoil dewatering will be monitored to prevent exceedances in the pond. To the extent necessary, Surface Water Quality Standards will be used to develop discharge limitations. |

**Notes:**

= Ambient Water Quality Criteria  
 = Comprehensive Environmental Response, Compensation, and Liability Act  
 CERCLA =  
 = Code of Federal Regulations  
 CFR =  
 = Code of Massachusetts Rules  
 CMR =  
 = Clean Water Act  
 CWA =  
 = Maximum Contaminant Level  
 MCL =  
 = Maximum Contaminant Level Goal  
 MCLG =  
 = Massachusetts Maximum Contaminant Level  
 MMCL =  
 = National Primary Drinking Water Regulations  
 NPDRW =  
 = Safe Drinking Water Act  
 SDWA =  
 = Secondary Maximum Contaminant Level  
 SMCL =

**TABLE 8-28**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 8**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION                                                                        | REQUIREMENT                                                                                         | STATUS                                                                                                | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                 | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                            |
|----------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Control of surface water runoff. Direct discharge to surface water.           | Clean Water Act Program [40 CFR 122.125]                                                            | Applicable AOC 9 AOC 11 AOC 40 Consolidation Facility                                                 | The National Pollutant Discharge Elimination System (NPDES) permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to waters of the United States.                                                                                                                        | Construction activities will be controlled to meet USEPA discharge requirements. On-site discharges will meet the substantive requirements of these regulations.                                                                                                                                                                                                                    |
| Federal              | Land Disposal of Hazardous Wastes.                                            | Resource Conservation and Recovery Act (RCRA), Land Disposal Restrictions (LDRs); (40 CFR Part 268) | Applicable SA 6 AOC 9 AOC 11 SA 12 SA 13 AOC 40 AOC 41                                                | Land disposal of RCRA hazardous wastes without specified treatment is restricted. Remedial actions must be evaluated to determine if they constitute "placement" and if LDRs are applicable. The LDRs require that wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility. | If it is determined that excavated materials are hazardous materials subject to LDRs, the materials will be handled and disposed of in compliance with these regulations.                                                                                                                                                                                                           |
| State                | Solid Waste Landfill Siting.                                                  | Massachusetts Solid Waste Facilities Site Regulations [310 CMR 16.00]                               | Applicable Consolidation Facility                                                                     | These regulations outline the requirements for selecting the site of a new solid waste landfill in the Commonwealth of Massachusetts.                                                                                                                                                                                                                                | The consolidation facility will be sited in accordance with these regulations.                                                                                                                                                                                                                                                                                                      |
| State                | Solid Waste Landfill Construction, Operation, Closure, and Post-Closure Care. | Massachusetts Solid Waste Management Regulations [310 CMR 19.100]                                   | Applicable AOC 9 AOC 11 SA 12 Relevant and Appropriate SA6 SA 13 AOC 40 AOC 41 Consolidation Facility | These regulations outline the requirements for construction, operation, closure, and post closure at solid waste management facilities in the Commonwealth of Massachusetts.                                                                                                                                                                                         | Final closure and post-closure plans will be prepared and submitted to satisfy the requirements of 310 CMR 19.021 for all disposal areas; however, only debris removal is proposed for AOC 11.<br><br>The consolidation landfill for SA 6, AOC 9, SA 12, SA 13, AOC 40, and AOC 41 will be constructed, operated, and closed in conformance with the regulations at 319 CMR 19.000. |
| State                | Activities that potentially affect surface water quality.                     | Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00]             | Relevant and Appropriate AOC 40                                                                       | For activities that require a MADEP Wetlands Order of Conditions to dredge or fill navigable waters or wetlands, a Chapter 91 Waterways License, a USACE permit or any major permit issued by USEPA (e.g., Clean Water Act NPDES permit), a Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00.      | Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to attain and maintain Massachusetts Water Quality Standards in affected waters.                                                                                                                                           |



**TABLE 8-28**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 8**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION | REQUIREMENT                                                    | STATUS                                                                                                | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                       |
|----------------------|--------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                |        | Massachusetts Air Pollution Control Regulations [310 CMR 7.00] | Applicable<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41<br>Consolidation Facility | These regulations pertain to the prevention of emissions in excess of Massachusetts or national ambient air quality standards or in excess of emission limitations in those regulations. Specifically, Section 6.04 governs ambient air quality such as particulate matter standards. Emissions from site treatment activities must be maintained at an annual geometric mean of 75 g/m <sup>3</sup> and a maximum 24-hour concentration of 40 mg/m <sup>3</sup> (primary standard). Carbon monoxide, nitrogen dioxide, and lead are also regulated. Section 7.02 governs plan approval and emissions limitations. A permit and BACT are required prior to operation. Under Section 7.02, visible emissions are limited. Additionally, the Massachusetts toxic air pollutant (TAP) control program requirements will be considered. | Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18). |

**Notes:**

CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Rules  
 CWA = Clean Water Act  
 MADEP = Massachusetts Department of Environmental Protection  
 MGL = Massachusetts General Laws  
 NPDES = National Pollutant Discharge Elimination System  
 USACE = U.S. Army Corps of Engineers  
 USC = United States Code

**TABLE 8 - 29**  
**COST SUMMARY TABLE**  
**ALTERNATIVE 8: LIMITED REMOVAL AT AOC 11;**  
**EXCAVATE AND CONSOLIDATE AOCs 9, 40, & 41, SA 6, 12, & 13**

**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| ITEM                                                   | TOTAL COST    |
|--------------------------------------------------------|---------------|
| <b>DIRECT COSTS</b>                                    |               |
| LIMITED REMOVAL AT AOC 11<br>EXCAVATE AND CONSOLIDATE  | \$ 44,000     |
| SA6                                                    | 64,000        |
| AOC 9                                                  | 3,835,000     |
| SA 12                                                  | 490,000       |
| SA 13                                                  | 502,000       |
| AOC 40                                                 | 3,370,000     |
| AOC 41                                                 | 93,000        |
| CONSOLIDATION LANDFILL CONSTRUCTION                    | 5,240,000     |
| <b>TOTAL DIRECT COSTS</b>                              | \$ 13,638,000 |
| <b>INDIRECT COSTS</b>                                  |               |
| HEALTH AND SAFETY                                      | \$ 682,000    |
| LEGAL, ADMIN, PERMITTING                               | 682,000       |
| ENGINEERING                                            | 1,364,000     |
| SERVICES DURING CONSTRUCTION                           | 1,364,000     |
| <b>TOTAL INDIRECT COSTS</b>                            | \$ 4,092,000  |
| <b>TOTAL CAPITAL (DIRECT + INDIRECT) COSTS</b>         | \$ 17,730,000 |
| <b>OPERATION AND MAINTENANCE COSTS</b>                 |               |
| TOTAL ANNUAL O&M COSTS FOR AOC 11 - 2 YRS              | \$ 4,000      |
| TOTAL ANNUAL O&M COSTS CONSOLIDATION LANDFILL - 30 YRS | 23,000        |
| TOTAL ADDITIONAL ANNUAL O&M COSTS FOR AOC 40 - 5 YRS   | 29,000        |
| <b>TOTAL PRESENT WORTH OF O&amp;M COSTS</b>            | \$ 411,000    |
| <b>TOTAL COSTS ALTERNATIVE 8</b>                       | \$ 18,141,000 |



**TABLE 8-30**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 9**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                | REQUIREMENT                                                                                 | STATUS                                                              | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                      |
|----------------------|----------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Floodplains                            | Floodplain Management Executive Order No. 11988 [40 CFR Part 6, App. A]                     | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.                                                                                                                                                                                                                                       | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |
|                      | Wetlands                               | Protection of Wetlands Executive Order No. 11990 [40 CFR Part 6, App. A]                    | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.                                                                                                                                                                                                                                                                                                                                               | Drum removal, hot-spot sediment removal, and landfill capping will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary. |
| Federal              | Wetlands Aquatic Ecosystem             | Clean Water Act, Dredge or Fill Requirements Section 404 [33 CFR Part 230; 40 CFR Part 230] | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41 | Section 404 of the Clean Water Act regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a discharge of fill materials. Procedures for complying with regulatory conditions are contained in 33 CFR Part 323. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under Clean Water Act Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands. | The removal of drums/sediments and cover installation will be designed to minimize placement of fill in wetland areas. If this alternative is chosen, the affected areas will be restored to the extent necessary.                                            |
| Federal              | Construction over/in navigable waters. | Rivers and Harbors Act of 1899 [33 USC 401 et seq.]                                         | Applicable<br>AOC 40                                                | Section 10 of the Rivers and Harbors Act of 1899 requires an authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers (USACE), for the construction of any structure in or over any "navigable water of the U.S."; the excavation from or deposition of material in such waters, or any obstruction of alteration in such waters.                                                                                                                                                                                                                                                                                                                                             | Excavating, filling, and disposal activities will be conducted to meet the substantive criteria and standards of these regulations.                                                                                                                           |

**TABLE 8-30**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 9**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC                                   | REQUIREMENT                                                              | STATUS                                                                                                              | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                     |
|----------------------|-----------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Surface Waters<br>Endangered Species<br>Migratory Species | Fish and Wildlife Coordination Act [16 USC 661 et seq.; 40 CFR Part 302] | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41                                                 | Actions that affect species/habitat require consultation with U.S. Department of Interior, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions.<br>Under 40 CFR Part 300.38, these requirements apply to all response activities under the National Contingency Plan. | To the extent necessary, actions will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The U.S. Fish and Wildlife Service, acting as a review agency for the USEPA, will be kept informed of proposed remedial actions. |
|                      | Endangered Species                                        | Endangered Species Act [16 USC 1531 et seq.; 50 CFR Part 402]            | Relevant and Appropriate<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41<br>Consolidation Facility | This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | The protection of endangered species and their habitat will be considered during excavation activities and cover installation.                                                                                                                                                               |
| Federal              | Atlantic Flyway Wetlands<br>Surface Waters                | Migratory Bird Treaty Act (16 USC 703-711)                               | Applicable<br>AOC 11                                                                                                | The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Remedial actions will be performed to protect migratory birds, their nests, and eggs.                                                                                                                                                                                                        |
| Federal              | Archeological Sites                                       | Archeological Resources Protection Act of 1979 [16 USC 47099-11]         | Relevant and Appropriate<br>SA 6                                                                                    | This law prohibits the excavation, damage, alteration, and trade of archeological resources obtained illegally from public or Native American.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Remedial actions will be performed to prevent the illegal excavation, damage, alteration, or trade of archeological resources.                                                                                                                                                               |



**TABLE 8-30**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 9**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| <b>REGULATORY AUTHORITY</b> | <b>LOCATION CHARACTERISTIC</b>            | <b>REQUIREMENT</b>                                                                                                                                        | <b>STATUS</b>                                                                                         | <b>REQUIREMENT SYNOPSIS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>ACTION TO BE TAKEN TO ATTAIN REQUIREMENT</b>                                                                                                     |
|-----------------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal                     | Archeological and Historic Sites          | Archeological and Historic Data Preservation Act [16 USC 469-469c; 40 CFR 469; 40 CFR 6.301(c)] and National Historic Preservation Act [16 USC 470-470w6] | Applicable<br>SA 6                                                                                    | These laws establish the procedures for the inventory, registration, and preservation of historical and archeological resources. Such resources must be retrieved, preserved, and properly managed when terrain is altered as a result of a federal or federally licensed construction activity.                                                                                                                                                                                                                                                                                                                                                        | Remedial actions will be conducted to inventory, register, and preserve historical and archeological resources.                                     |
| State                       | Floodplains<br>Wetlands<br>Surface Waters | Massachusetts Wetland Protection Act and regulations [MGL c. 131 s. 40; 310 CMR 10.00]                                                                    | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41                                   | These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year floodplain). A Notice of Intent (NOI) must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons. | All work to be performed within wetlands and the 100 foot buffer zone will be in accordance with the substantive requirements of these regulations. |
| State                       | Construction over/in a waterway.          | Massachusetts Waterways Act [MGL c. 91; 310 CMR 9.00]                                                                                                     | Relevant and Appropriate<br>AOC 40                                                                    | The Massachusetts Waterways Act and regulations require that a license from Massachusetts Department of Environmental Protection (MADEP) be obtained for any work in or over any tidelands, river or stream (with respect to which public funds have been expended), or great pond, or outlet thereof.                                                                                                                                                                                                                                                                                                                                                  | Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations                                  |
| State                       | Endangered Species                        | Massachusetts Endangered Species Act and implementing regulations [MGL c. 131A, s. 1 et seq.; 321 CMR 8.00]                                               | Applicable<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41<br>Consolidation Facility | Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.                                                                                                                                                                                                                                                                                                                                                                                                                                                      | The protection of state listed endangered species will be considered during the design and implementation of this alternative.                      |

**TABLE 8-30**  
**SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 9**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | LOCATION CHARACTERISTIC | REQUIREMENT                          | STATUS            | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                       |
|----------------------|-------------------------|--------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| State                | Nashua River            | Scenic Rivers Act (MGL c. 21 s. 27B) | Applicable AOC 11 | As part of the Massachusetts Department of Environmental Management's Scenic Rivers Program, the Nashua River and contiguous land up to 100 yards on each side of its natural banks are afforded special protection under this law. | Remedial activities will be performed to comply with the substantive requirements of this act. |

**Notes:**

= Code of Federal Regulations  
 CFR = Code of Massachusetts Regulations  
 CMR = Clean Water Act  
 CWA = Department of the Interior  
 DOI = Fish and Wildlife Service  
 FWS = Massachusetts Environmental Policy Act  
 MEPA = Massachusetts General Laws  
 MGL = National Marine Fisheries Service  
 NMFS = United States Code  
 USC =



**TABLE 8-31**  
**SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 9**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                                                                                   | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Surface water   | Clean Water Act, Ambient Water Quality Criteria [40 CFR 131: Quality Criteria for Water 1986]                                 | Applicable<br>AOC 11<br>AOC 40 | Federal Ambient Water Quality Criteria (AWQC) include (1) health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and (2) acute and chronic toxicity values for the protection of aquatic life. AWQC for the protection of human health provide protective concentrations for exposure from ingesting contaminated water and contaminated aquatic organisms, and from ingesting contaminated aquatic organisms alone. Remedial actions involving contaminated surface water or discharge of contaminants to surface water must consider the uses of the water and the circumstances of the release or threatened release. | Remedial actions will be performed in a manner to prevent AWQC exceedances in surface water. Activates at AOC 11 will be performed to prevent AWQC exceedances in the Nashua River. Removal of sediment at AOC 40 will be performed in a manner to prevent AWQC exceedances in Cold Spring Brook Pond. Supernatant from dredged spoil will be monitored to prevent AWQC exceedances in Cold Spring Brook Pond. |
|                      | Groundwater     | Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.53] | Applicable<br>AOC 40           | The National Primary Drinking Water Act establishes Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health based goals set equal to or lower than MCLs.                                            | At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average conditions, and the MCL for arsenic will be met under average and maximum conditions. MCLs are not exceeded at Patton Well.                                                                                                                                                                                                         |

TABLE 8-31  
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 9

LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA

| REGULATORY AUTHORITY | CHEMICAL MEDIUM | REQUIREMENT                                                  | STATUS                         | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------|-----------------|--------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                | Surface water   | Massachusetts Surface Water Quality Standards [314 CMR 4.00] | Applicable<br>AOC 11<br>AOC 40 | Massachusetts Surface Water Quality Standards designate the most sensitive uses for which surface waters of the Commonwealth are to be enhanced, maintained, and protected, and designate minimum water quality criteria for sustaining the designated uses. Surface waters at Fort Devens are classified as Class B. Surface waters assigned to this class are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. These criteria supersede federal AWQC only when they are more stringent (more protective) than the AWQC. | At AOC 11 activities will be performed in a manner to prevent exceedances of surface water quality in the Nashua River.<br><br>At AOC 40 sediment removal will be performed in a manner to prevent exceedances of Surface Water Quality Standards in Cold Spring Brook Pond. Supernatant from dredged spoil dewatering will be monitored to prevent exceedances in the pond. To the extent necessary, Surface Water Quality Standards will be used to develop discharge limitations. |

Notes:

AWQC = Ambient Water Quality Criteria  
 CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act  
 CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Rules  
 CWA = Clean Water Act  
 MCL = Maximum Contaminant Level  
 MCLG = Maximum Contaminant Level Goal  
 MMCL = Massachusetts Maximum Contaminant Level  
 NPDR = National Primary Drinking Water Regulations  
 SDWA = Safe Drinking Water Act  
 SMCL = Secondary Maximum Contaminant Level



**TABLE 8-32**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 9**  
**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| REGULATORY AUTHORITY | ACTION                                                                        | REQUIREMENT                                                                                         | STATUS                                                                                                                            | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                 | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                                                                                           |
|----------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Federal              | Control of surface water runoff.<br>Direct discharge to surface water.        | Clean Water Act Program [40 CFR 122.125]                                                            | Applicable<br>AOC 9<br>AOC 11<br>AOC 40<br>Consolidation Facility                                                                 | The National Pollutant Discharge Elimination System (NPDES) permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to waters of the United States.                                                                                                                        | Construction activities will be controlled to meet USEPA discharge requirements. On-site discharges will meet the substantive requirements of these regulations.                                                                                                                                   |
|                      | Land Disposal of Hazardous Wastes.                                            | Resource Conservation and Recovery Act (RCRA), Land Disposal Restrictions (LDRs); (40 CFR Part 268) | Applicable<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41                                                       | Land disposal of RCRA hazardous wastes without specified treatment is restricted. Remedial actions must be evaluated to determine if they constitute "placement" and if LDRs are applicable. The LDRs require that wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility. | If it is determined that excavated materials are hazardous materials subject to LDRs, the materials will be handled and disposed of in compliance with these regulations.                                                                                                                          |
| State                | Solid Waste Landfill Siting.                                                  | Massachusetts Solid Waste Facilities Site Regulations [310 CMR 16.00]                               | Applicable<br>Consolidation Facility                                                                                              | These regulations outline the requirements for selecting the site of a new solid waste landfill in the Commonwealth of Massachusetts.                                                                                                                                                                                                                                | The consolidation facility will be sited in accordance with these regulations.                                                                                                                                                                                                                     |
| State                | Solid Waste Landfill Construction, Operation, Closure, and Post-Closure Care. | Massachusetts Solid Waste Management Regulations [310 CMR 19.100]                                   | Applicable<br>AOC 9<br>AOC 11<br>SA 12<br>Relevant and Appropriate<br>SA 6<br>SA 13<br>AOC 40<br>AOC 41<br>Consolidation Facility | These regulations outline the requirements for construction, operation, closure, and post closure at solid waste management facilities in the Commonwealth of Massachusetts.                                                                                                                                                                                         | Final closure and post-closure plans will be prepared and submitted to satisfy the requirements of 310 CMR 19.021 for all disposal areas.<br><br>The consolidation landfill for all disposal areas will be constructed, operated and closed in conformance with the regulations at 319 CMR 19.000. |
| State                | Activities that potentially affect surface water quality.                     | Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00]             | Relevant and Appropriate<br>AOC 40                                                                                                | For activities that require a MADEP Wetlands Order of Conditions to dredge or fill navigable waters or wetlands, a Chapter 91 Waterways License, a USEPA permit or any major permit issued by USEPA (e.g., Clean Water Act NPDES permit), a Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00.      | Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to attain and maintain Massachusetts Water Quality Standards in affected waters.                                                          |

**TABLE 8-32**  
**SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 9**

**LANDFILL REMEDIATION FEASIBILITY STUDY  
DEVENS, MA**

| REGULATORY AUTHORITY | ACTION | REQUIREMENT                                                    | STATUS                                                                                                | REQUIREMENT SYNOPSIS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ACTION TO BE TAKEN TO ATTAIN REQUIREMENT                                                                                                                                                                                       |
|----------------------|--------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State                |        | Massachusetts Air Pollution Control Regulations [310 CMR 7.00] | Applicable<br>SA 6<br>AOC 9<br>AOC 11<br>SA 12<br>SA 13<br>AOC 40<br>AOC 41<br>Consolidation Facility | These regulations pertain to the prevention of emissions in excess of Massachusetts or national ambient air quality standards or in excess of emission limitations in those regulations. Specifically, Section 6.04 governs ambient air quality such as particulate matter standards. Emissions from site treatment activities must be maintained at an annual geometric mean of 75 g/m <sup>3</sup> and a maximum 24-hour concentration of 40 mg/m <sup>3</sup> (primary standard). Carbon monoxide, nitrogen dioxide, and lead are also regulated. Section 7.02 governs plan approval and emissions limitations. A permit and BACT are required prior to operation. Under Section 7.02, visible emissions are limited. Additionally, the Massachusetts toxic air pollutant (TAP) control program requirements will be considered. | Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18). |

**Notes:**

CFR = Code of Federal Regulations  
 CMR = Code of Massachusetts Rules  
 CWA = Clean Water Act  
 MADEP = Massachusetts Department of Environmental Protection  
 MGL = Massachusetts General Laws  
 NPDES = National Pollutant Discharge Elimination System  
 USACE = U.S. Army Corps of Engineers  
 USC = United States Code



**TABLE 8 - 33**  
**COST SUMMARY TABLE**  
**ALTERNATIVE 9: EXCAVATE AND CONSOLIDATE ALL DEBRIS AREAS**

**LANDFILL REMEDIATION FEASIBILITY STUDY**  
**DEVENS, MA**

| ITEM                                                   |  | TOTAL COST           |
|--------------------------------------------------------|--|----------------------|
| <b>DIRECT COSTS</b>                                    |  |                      |
| SA6                                                    |  | \$ 64,000            |
| AOC 9                                                  |  | 3,835,000            |
| AOC 11                                                 |  | 1,571,000            |
| SA 12                                                  |  | 490,000              |
| SA 13                                                  |  | 502,000              |
| AOC 40                                                 |  | 3,370,000            |
| AOC 41                                                 |  | 93,000               |
| CONSOLIDATION LANDFILL CONSTRUCTION                    |  | 5,240,000            |
| <b>TOTAL DIRECT COSTS</b>                              |  | <b>\$ 15,165,000</b> |
| <b>INDIRECT COSTS</b>                                  |  |                      |
| HEALTH AND SAFETY                                      |  | \$ 758,000           |
| LEGAL, ADMIN, PERMITTING                               |  | 758,000              |
| ENGINEERING                                            |  | 1,517,000            |
| SERVICES DURING CONSTRUCTION                           |  | 1,517,000            |
| <b>TOTAL INDIRECT COSTS</b>                            |  | <b>\$ 4,550,000</b>  |
| <b>TOTAL CAPITAL (DIRECT + INDIRECT) COSTS</b>         |  | <b>\$ 19,715,000</b> |
| <b>OPERATION AND MAINTENANCE COSTS</b>                 |  |                      |
| TOTAL ANNUAL O&M COSTS CONSOLIDATION LANDFILL - 30 YRS |  | \$ 23,000            |
| TOTAL ADDITIONAL ANNUAL O&M COSTS FOR AOC 40 - 5 YRS   |  | 29,000               |
| <b>TOTAL PRESENT WORTH OF O&amp;M COSTS</b>            |  | <b>\$ 480,000</b>    |
| <b>TOTAL COSTS ALTERNATIVE 9</b>                       |  | <b>\$ 20,195,000</b> |